SCIENTIFIC AMERICAN

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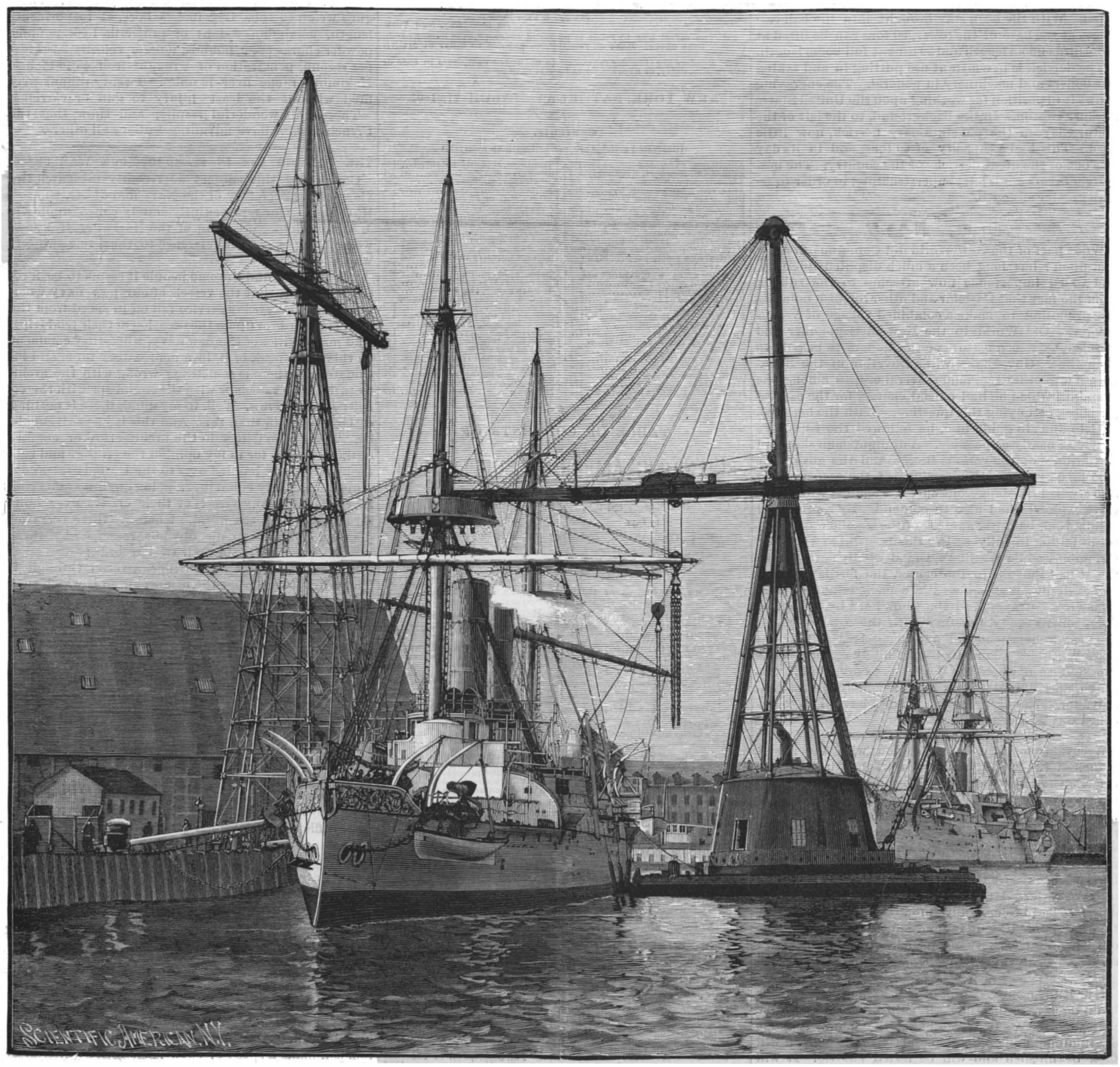
THE NEW STEEL FLOATING DERRICK AT THE BROOKLYN NAVY YARD.

We illustrate herewith a new steel derrick of great lifting power, recently constructed for the United States Navy Yard, Brooklyn, N. Y. It was built by the Pusey & Jones Ship Building Company. Its calculated and allowed lifting power is 75 tons, making it rank among the most powerful of the floating derricks in this harbor.

The structure is carried upon a pontoon, rectangular in shape, 60 feet wide by 63 feet long. The pontoon is divided into compartments, access to which is had through hatches or manholes, and is ballasted with 22 tons of cement ballast; the steel weighs in itself 70 tons. The superstructure is placed upon the long axis of the pontoon, and is a little advanced toward its front edge, in order to give the boom a greater reach. At its rear end there are five tanks for water ballast, and since its completion two auxiliary water tanks have been put in on each side. The object of these tanks is to afford a counterballast during heavy lifting operations. In the pontoon is established a powerful pump with 6 and 8 inch connections, that can empty all the five main ballast tanks in half an hour. A couple of fire hose connections are provided, so that the pump can be used in an emergency as an auxiliary fire engine.

The tower is built of steel I beams and rods and contains 63 tons of metal. The base ring on which it stands rises 4 feet from the deck. Measured on the slope of the main struts, the length is 58 feet 8 inches to the first platform, termed the crow's nest, upon which the base of the king post rests. The struts continue above this until they reach the crown casting. The king post is 65 feet high; 14 feet 7 inches from its base it passes through the crown casting. Just above the crown casting the front and back booms are connected to it. The back boom is a box girder made up of plates and angle irons, and is 2 feet square, weighing $6\frac{4}{10}$ tons. The two members of the front boom are $16\frac{1}{2}$ inch I beams, spaced far enough apart for the sheaves and tackle to work between. The object of the back boom is simply to afford a point of attachment with advantageous leverage for the back stays. These may be fastened at one of two points. As shown in the drawing, they are attached to what is known as the ball carriages, that work upon a circular railroad that runs around the base ring. When thus connected the boom can be swung around, the ball carriages traveling around the base also. For very heavy lifting the back stays are disconnected from the ball carriages and are secured upon turn buckles placed upon the after edge of the pontoon, thus increasing their power, but at the same time preventing the boom from being swung.

The upper surface of the members of the main boom has planed upon it sliding ways for the carriage which supports the sheaves. This carriage bears two lifting tackles. One is a gantline or single fall, for light work; the other is a 16-fold purchase, for heavy lift-



THE NEW STEEL FLOATING DERRICK AT THE BROOKLYN NAVY YARD.

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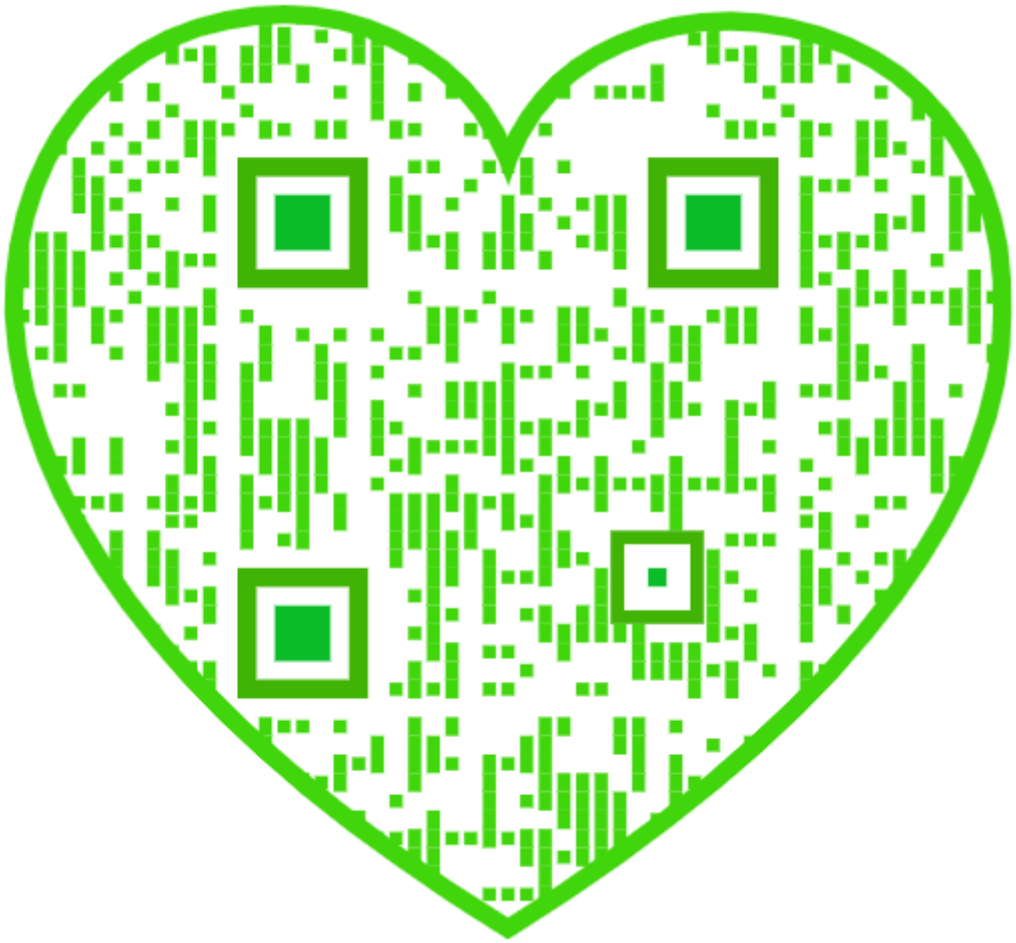

ing. At the end of the boom stationary sheaves are secured, and tackle is provided for drawing the sliding carriage in and out, according to requirements. In order to rotate the beam, a single line of steel rope is carried around the base ring bearing against a number of rollers set vertically. The ends of the rope are secured to the ball carriages at the end of the back stay. These ropes enter the engine room, and are carried to a windlass drum, and being pulled one way or the other draw the ball carriages around the base ring and cause the boom to swing as desired.

All tackle is carried to one main hoisting engine placed upon the deck of the pontoon in the engine house. This engine has two cylinders 8 by 14 inches, and by a system of worm gearing and clutches actuates any of the different windlass drums required. To give some idea of the size of the parts, it may be mentioned that the hoisting gear alone weighs 13½ tons; that the lower main hoisting block, with its eight sheaves, each 26 inches in diameter and working on a 2½ inch steel pin, and receiving 1⅛ inch steel wire rope, weighs 2,000 pounds.

As regards bearings, ball bearings are used at three places. One, as just mentioned, at the foot of the back stay, another at the foot of the king post, and another upon the crown casting directly under the booms. The sheaves in all the blocks have plain brass bearings.

Two windlasses are established upon the deck of the pontoon outside the house, and are driven by a Manton steam-capstan engine. These are useful in moving the pontoon and in many operations on shore or on a ship's deck.

The load limit is as follows: With the back stay secured to the after edge of the pontoon, 75 tons can be lifted with the sliding carriage at two-thirds the length of the boom, and at full boom length 50 tons can be lifted. With the back stay brought into the ball carriages at the base of the tower, 30 tons can be lifted at two-thirds boom length and 30 tons at full boom length.

The derrick is in constant use putting in and taking out boilers and machinery in general. The engraving shows it in position for working upon the United States steamer Boston. In the background, to the left of the picture, is seen the old stationary derrick, now little used. This had a capacity of 60 tons, and in its day was one of the great derricks of the country. The new system favors a less lofty superstructure, in order to secure greater strength.

Miscellaneous Notes.

What part of the New World did Columbus first set foot upon? has long been a much disputed question, and added importance now attaches to the subject from the fact that Castelar and other Spanish notables are proposing to make a combined voyage of vessels from the Old World to the New in September and October, 1892, as a feature of the honors to be paid to Columbus. Gov. Blake, while Governor of the Bahamas, a few years ago, made several cruises among the islands of which he had official charge, for the express purpose of studying this question. With the log book of Columbus to guide him, he followed the explorer's course as nearly as possible. A draughtsman sketched the outlines of the various shores, and the governor's wife made water color drawings of the scenery. He also studied the dangerous currents against which the early explorers had also to contend. By a process of elimination, one after another of the islands was rejected, as failing to fully satisfy the description given by Columbus, while Watling's Island wholly agreed with it. It had the lake in the center, the fertile soil, the reef encircling it except at the capacious harbor with its narrow entrance, and the bluff hard by. Such an independent study, together with the conclusions of the geographers who had not themselves seen it, entitles Watling's Island to be definitely considered as the spot seen when the joyful cry of "Land!" was raised, and indeed it has been officially named San Salvador, although many authors have heretofore called Cat Island San Salvador.

A curious incident in connection with the recent launch of the Royal Arthur at Portsmouth, England, is made the subject of a sketch by a London illustrated paper. No sooner had the water become quiet after the vessel left the ways, than numerous small boats appeared upon the scene, and their occupants, equipped with a variety of long-handled scoops, began to collect the grease floating upon the surface, and which had been used to insure the slipping of the vessel smoothly into the water. It is said that several hundredweight of grease had been employed for this purpose, and the thrifty boatmen would undoubtedly be able to dispose of their unique variety of flotsam for similar dockyard service in the future.

MR. RENARD, the distinguished French aeronaut, is building a new dirigible air ship of over 3,000 cubic yards capacity. It is said that the motor is made of aluminum and operates perfectly. The balloon will soon be finished and will be tested shortly. It will leave Meudon and maneuver between Versailles and Paris.

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THE GREAT GUNS OF THE JAPANESE NAVY.

The attention of naval and military authorities has been strongly drawn of late to the remarkable differences in the effective power of the heavy guns of English make and those of the French.

The 110 ton guns of the English navy, constructed at immense cost, represent the latest and most formidable type of armament which Britain has produced. If the calculations of the makers could be realized in practice, the power of these guns would be astonishing. They are 43 ft. 8 in. long, 16¼ in. bore, intended to sustain a charge of 960 lb. of powder, carry a projectile of 1,800 lb. with a muzzle velocity of 2,128 ft. per second, equal to penetration of almost 34 inches of wrought iron. Several trials of these guns have been made with charges much below the maximum, and in every instance the guns have been so much injured as to render it dangerous to subject them to full tests. The latest trial was that of the 110 ton gun of the war ship Sans Pareil, at Shoeburyness, with a moderate charge of powder. The result was the bore of the gun was found to have drooped and also to have become laterally deflected. This is much to be regretted, for the gun is a magnificent specimen of mechanical construction.

In France the great company known as the Forges et Chantiers de la Mediterranee, at Havre, under contract with the Japanese government, have produced some large Canet guns for the war vessels of that nation, which must be conceded to stand at the present time in the front rank. Japan may be said to beat the world in the actual power of her heavy guns. They have been subjected to the severest tests, no expense having been spared in these trials to render them sure and effective. Each round fired cost $2,000, and some $40,000 in all were spent for the purpose. These guns weigh 66 tons, 12½ inches bore, 41 feet 8 inches length, maximum weight of projectile 1,034 pounds, powder charge 562·2 pounds, muzzle velocity 2,262 feet per second, penetration of wrought iron 45·16 inches. Maximum range over 13 miles. Twenty rounds were fired without the least injury to gun or carriage.

These are wonderful results, and show that the French makers have advantages above all others.

THE FALLING OFF IN SPEED OF OUR WAR SHIPS.

Concerning this subject we recently presented the views of the Secretary of the Navy and of Mr. Charles H. Cramp. Our representative lately called upon Mr. J. Taylor Ganse, president of the Harlan & Hollingsworth Company, with reference to the same subject, who said:

"It is a fact, and to some people it seems to be a remarkable one, that the vessels of our new navy when in ordinary every-day service fall off in speed from the high standard set up on the occasion of their trial trips. And many critics of the new navy, when they comment on this fact, speak of it in a deprecatory tone, and insinuate that there is something wrong with the architecture of the vessels or with the engines or with the efficiency of the crew. Well, to my mind, there is nothing easier to explain than this. And this is just as it should be. There is no defect in the architecture or engines of these vessels, for in my opinion the cruisers and battleships recently handed over to the United States government are fully equal in sea-going qualities and general efficiency to any vessels of their classes ever built for any nation in the world. There are three very simple and, it seems to me, obvious reasons why these vessels do not maintain their trial records:

First. The object of putting a vessel through a trial trip is to see what the utmost speed is which that vessel can possibly attain. It is not in actual service. The contractors see in the horizon one little word, *speed*, and with that before them they shape their course. They are on dress parade, and the every-day regulation incidents, such as heavy guns, ammunition for the guns and for the hungry crew, appliances, etc., are laid aside. It is now or never with the builders. But when it comes to ordinary running, the circumstances are changed. The vessels are laden with guns, with provisions, and with all the necessary outfit for a long voyage. All of this means weight; and with this enormous additional weight she puts to sea, with her decks nearer the surface of the water, and with a consequently augmented displacement. But this makes it more difficult to propel her through the water, and her speed must therefore suffer.

Secondly. An iron bottom when exposed to sea service for any length of time begins to foul, to accumulate vegetable growths, and the longer a vessel is in the water the greater will be this growth, and consequently the greater will be the deterioration in speed from that of the trial trip, when the bottom was clean and free from anything that would retard the speed of the vessel. This retardation in cases where a vessel has been in the water for a month is immense, and this one act alone would be enough to cause a great falling off in speed. In fact it is not too much to say that, all other things being equal, a vessel with a clean bottom can make a speed of twenty-five knots in the same time it would take a vessel with a foul bottom to make ten knots.

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Thirdly. The two foregoing reasons are sufficient to explain why the government cruisers do not maintain their trial speeds. The third reason why they do not do this is because they certainly ought not to do it. The most industrious day laborer will not perform much more work than his fellows, for the reason that he will gain nothing thereby and further labor would be energy misdirected. And so it is with the government cruiser. There is positively no reason why these vessel should be constantly kept up to their maximum speed. Nothing is gained by it. One such trial is enough to demonstrate what the vessel is capable of. Any more would be a gross extravagance of fuel, and would lead to a strong demand for retrenchment in the government service. In short, the question may be summed up thus: With foul bottoms and heavily laden hulls and decks, the navy department could not, if it would, keep the vessels up to the trial records, and because of the enormous but necessary consumption of coal the department would not, if it could, because no useful purpose would be served thereby.

The second reason I have given for the retardation of speed, namely, the fouling of the bottoms, is one of the great difficulties with which the navy has to contend. Many experiments have been tried for the purpose of obtaining a remedy, but, as yet, no success has been reached, and the man who does succeed in discovering or inventing a preventive of this animal growth will achieve large fortune and everlasting fame. This is certainly a large field for the labors of the inventive and scientific genius of America. The only process that has been tried thus far with any success is a very expensive one, and the government has not as yet seen fit to adopt it. The process is applied when the vessel is new, and consists in planking the vessel's bottom with wood and thoroughly calking the seams. If the vessel is now sheathed with yellow metal, she is good for a two or three years' cruise without much danger of her bottom becoming foul. Naval vessels are not alone subject to this difficulty. The transatlantic passenger steamers, if they were not taken out of the water at short intervals and thoroughly scraped and painted, would also fall off in speed and efficiency from their initial performance. The power in possession of these steamers would have a great advantage over its enemy in the event of a naval war, and it is for this reason the British government adheres to the policy of subsidizing passenger lines, that it may on the outbreak of a war convert the ocean racers into gunboats, to be used in commerce destroying; and the United States will never have a merchant marine from which to recruit a naval establishment until it also assists in subsidizing fast steamships for carrying the mails.

But we are not so badly off regarding commerce destroyers as some critics of the navy pretend. If war were at hand, it would be the work of a short time to thoroughly overhaul our cruisers. One great trouble, however, is our lack of efficient sailors to man the modern ships. We have no merchant marine, and, therefore, no source of supply; and this is another reason why the United States should subsidize steamship lines. The class of vessels which our navy most needs is battle ships. Cruisers will certainly play an important part in the next naval war; but we also need a good fleet of battle ships for the heavier work. The torpedo boat will render satisfactory service in coast defense, but will play rather an indifferent part at sea. In view of the rapid deterioration of metal sheathing, it has been suggested that we return to wood for construction purposes. But the greatest obstacle to this is the fact that wood could not stand the strain of the heavy appliances on board modern ships, and the vessels would not probably hold together one year.

The proposition that the new cruisers be employed in carrying the mails in order to keep them up to their maximum efficiency is not a good one, for the reason that it would make against efficiency and economy. It would be highly extravagant to carry the mails in government vessels at an expense of $500 when the same service now costs the government $100. This incessant activity on the part of the cruisers would also result in the deterioration of the engines.

It has been urged that the coal bunkers of the new cruisers are not of sufficient capacity. This is not a fact. The so-called falling off in speed from the trial is not due to any lack of coal, but to the reasons I have given above.

Remarkable Storm in England.

A great storm, strongly suggestive of the memorable blizzard at New York in March, three years ago, swept over the south of England on March 9. Heavy snow fell, and the wind blew with almost hurricane violence over a section which extended from St. George's Channel to the North Sea. In London, the great Covent Garden market was almost deserted, the market wagons bringing supplies not being able to reach their stalls, and for a few hours there was a short supply of milk and vegetables. Many of the law courts had to suspend business, the judges not being able to attend. All the railroads on the south coast were more or less blockaded by snow, there being many cases of severe suffering from the consequent forced detention. The channel steamer Victoria plying between Dover and Calais, which usually makes the passage in about forty-five minutes, required eighteen hours, during the height of the blizzard, to cross the "silver thread" of water separating England from France, the officers losing their bearings and the vessel being obliged to anchor. Such severe weather is far more unusual in England than it is in this country, at even a much more lower latitude, but previous accounts have shown that the past winter has been a remarkably severe one, not only in England, but throughout Europe, heavy snows having fallen where snow had been almost unknown for many years.

Laying Water Pipes across Rivers.

At a meeting of the New England Water Works Association, Boston, Mr. Gowing read a paper on the best means of laying water pipes across a river, whether on the bed of the river or across a bridge, referring to some 8 inch pipe laid under water at Skowhegan, Me., under his direction.

Mr. Holden, superintendent, Nashua, N. H., spoke of some 700 feet of pipe which he was going to lay across the Merrimac River. He proposed to carry this over a bridge, and to use wrought iron or steel pipe.

Phinehas Ball, of Worcester, Mass., gave an account of laying certain water mains for the Springfield, Mass., water works in 1874. It was necessary to cross the Chicopee River at a point where there was a rapid fall. On either side an abutment was built, making a span of 173 feet. Two 24-inch mains were made of ⅜-inch boiler iron riveted together, and placed in position so as to form the upper chords of a bridge between the abutments. These pipes had expansion joints at each end. Water was let in during the latter part of December, 1874, and although the pipes were without any covering whatever, no trouble was experienced from freezing. Another similar case, at New Haven, Conn., was referred to, where, although the pipes were suspended under the bridge, they were entirely independent of it. At Greenfield, Mass., a number of years ago, some 8-inch pipe was laid down a ravine or narrow gorge, partly on the rocks and partly on iron supports, and, although in use for six or seven years, and exposed to the weather without any covering, there was said to have never been any trouble from freezing. In such cases, and those under consideration, Mr. Ball recommended wrought iron or steel pipe.

In the discussion Dexter Brackett said that whether a pipe should be laid under or over a stream depended on the temperature to be met with. Referring to a 16-inch pipe supplying the whole town of Everett a few years ago he said that it was frozen solid, although for several years it had given no trouble. This pipe was not boxed in. To prevent freezing, Mr. Brackett thought that more dependence could be placed on a tight air space than on boxes filled with sawdust or similar material. In certain cases he had double-boxed the pipes and filled in the space between the boxes with coal tar asphalt, so as to make an air-tight covering for the pipes themselves. In considering the question of a pipe over or under a stream, it should be remembered that the pipe over the stream is more accessible to the superintendent in determining leaks, etc. Mr. Jones, ex-superintendent Boston water works, referred to the severity of the winter of 1875, when the city had ten or fifteen streets opened to take care of frozen water pipes. During that winter 5,000 feet of service pipes were frozen. Of this length 2,000 feet could not be reached until the spring.

The Gramophone.

In the SCIENTIFIC AMERICAN of July 19, 1890, we illustrated and described this interesting form of speaking and recording apparatus, the invention of Mr. E. Berliner. Since then he has made several improvements. In a recent address before the American Institute of Electrical Engineers he said:

One of the mechanical curiosities of the gramophone is the fact that the etched record itself is the screw which propels the diaphragm from periphery to center, for the stylus resting in the groove by gravity or slight pressure not only is vibrated, but following it and being able to move freely, is led along to the center and to the end of the etched record automatically. This places the gramophone reproducer in the realm of extreme simplicity, and beyond the necessity of repair under ordinary every-day conditions.

The possibilities of extending the gramophonic principle are, perhaps, more noteworthy than its present development. The disks can be easily duplicated, and at the first exhibition in Philadelphia I showed an electrotype copy of a 12 inch disk which sounded precisely like the original. Since then, I have also succeeded in making talking copies by pressing a matrix into molten glass, but the matrix being of copper, the glass used to stick to the form, and warped the glass copy. I am assured, however, that whenever I shall furnish a steel matrix, the perfect copying in glass will be entirely feasible. That such steel matrices can be made is not doubted by those familiar with the art of transferring lines, and then etching the same.

We may then have dinner sets, the dessert plates of which have gramophone records pressed in them, and which will furnish the after-dinner entertainment when the repast is over. Gramophone plaques with the voices of eminent people will adorn our parlors and libraries.

Very successful copies have been made in celluloid from electrotype matrices, and such celluloid copies are particularly free from all frictional noise, provided the celluloid is pressed hard, and of well-seasoned material. Gramophone records have been printed, and such prints have been photo-engraved, and the copy thus obtained sounded precisely like the original.

The work of gradually bringing the gramophone up to the present state has been exceedingly tedious. Working out telephones or transmitters is child's play in the face of the traps and Jack-o'-lanterns which beset the experiments with talking machines. The size, form, and material of the mouthpiece, the density, length and diameter of the speaking tube, the size, thickness and material of the diaphragms, the tension, temper, and thickness of the springs, shape of the needle points, temperature of the room in which the disks are coated, the quality of the beeswax, the strength of the acid, and the method of manipulating the sounds of voices and of various instruments—all these gave rise to errors and pitfalls, which only continuous repetitions of whole series of tests could locate, avoid, or obliterate.

The important subject of good articulation has ever been kept in the foreground, and this is now in so satisfactory a shape that I am carrying on a vocal correspondence with my friends in Europe, by means of small gramophone disks, which can be mailed in a good sized letter envelope.

Foremost among the feats which the gramophone can perform is the absolute certainty with which it enables people to recognize the speaker's voice, and I could cite a number of instances where persons have been made happy by hearing and recognizing the voices of loved ones whom they had not seen in years, and the owners of which were thousands of miles away.

This whole art is now manipulated with great certainty, and can be learned much easier than the art of photography. Yet, favorably as I believe the gramophone compares with other talking machines, it has barely entered upon the possibilities which lie dormant within its principles, only awaiting the touch of investigation to yield new and important scientific data.

Whatever the art of gramophony represents at the present time does not consist of accidental results, but the principles and the errors to be avoided are well known and established, and not a month passes but new light is thrown on hitherto obscure sections of manipulation, and after three years of work, in which numberless sources of error have been eliminated, the art of etching records has lost none of its attraction, rather fascinating the mind by presenting the possibility of unlimited applications in the service, and for the pleasure of mankind.

Coal and Gas as Fuels.

BY C. F. PRICHARD.

The fuel gas business will not revolutionize the heating business, as enthusiasts would have us believe; and this is so because of cost. If a person burns 10 tons of coal during a winter to heat his house, he will apply 260,000,000 heat units to this purpose. To obtain this heat from illuminating gas of 20 candle power, at 700 heat units per foot, would require 370,000 feet; if from fuel gas, of 320 heat units per foot, it would require 812,000 feet—the waste heat going to the chimney would be substantially the same in either case. With coal at $6 per ton the cost would be $60; with illuminating gas at $1 per 1,000, the cost would be $370; and with fuel gas at 50 cents, $406. The extra cost is so excessive that no one seriously thinks of house heating or of steam boiler heating by a distributed gas.

On the other hand, if he wishes to boil two quarts of water (about 4 pounds), it would require not less than 5 pounds of coal from the beginning to the end of the operation, costing 1½ cents, while 2 feet of gas, costing two-tenths of a cent, would do the work much quicker and with less labor expended.

Between these extremes are an infinite number of operations, the smaller ones showing a profit for gas, always with decreased labor. This percentage of profit gradually decreases as larger quantities of heat are required, till no economy is shown, and their profit appearing on the other side till the extreme is reached, in continuous operations requiring large amounts of heat.

Nothing new has been developed in fuel gas, unless it be negative results as to the commercial success of distributing it in towns and cities. Even in manufacturing plants it shows but little economy, but it has shown that it is a much better fuel, and that by its aid a better quality of goods can be produced.

No proofs have been given that a unit of heat can be produced and distributed in the shape of any of the so-called fuel gases cheaper than by illuminating gas.

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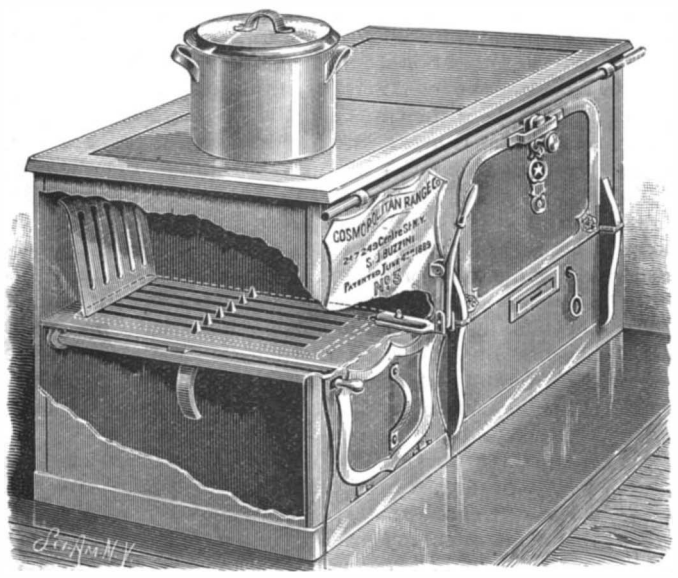
A GRATE FOR FURNACES, RANGES, ETC.

The illustration represents a grate, patented by Mr. Salvatore J. Buzzini, designed to be reciprocated horizontally to free the grate and fuel from the accumulation of ashes, the grate being made to swing down readily at one side, to dump the contents of the fire box into the ash pan when desired. The grate preferably lies below a bed plate of the fire box, and has on its upper surface a number of teeth-like projections, which, as the grate is reciprocated, serve to break up the bed of fuel resting on it. The bed plate of the fire



BUZZINI'S RANGE AND STOVE GRATE.

chamber also has at its ends downward projections to enter between the grate bars and prevent fuel being carried beneath the bed plate by the reciprocating grate, to jam or interfere with the free motion of the grate, which is reciprocated by means of a lever fulcrumed on the front of the range and connected below with the grate. At one margin the grate is hung upon a bar journaled at its ends in the main structure, the rotating or turning of this bar similarly moving the grate, upon the opposite side of which is arranged another bar, on the top of which rests a toe from the other side of the grate. The grate is dumped by swinging this bar laterally from under the supporting toe of the grate.

For further information relative to this invention address the Cosmopolitan Range Co., No. 247 Centre Street, New York City.

AN IMPROVED CASING FOR STEAM PIPES.

The Wyckoff patent steam pipe casing shown in the accompanying illustrations is made of double thicknesses of eight thoroughly seasoned one inch white pine staves to each section. The staves of the inner course are jointed together and wound with

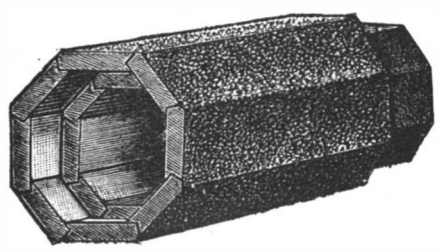


Fig. 1.

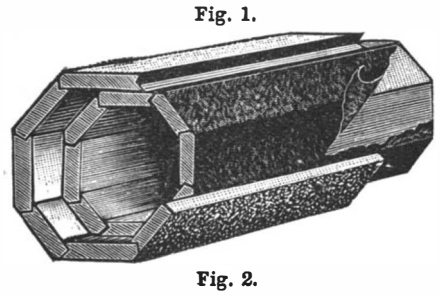


Fig. 2.

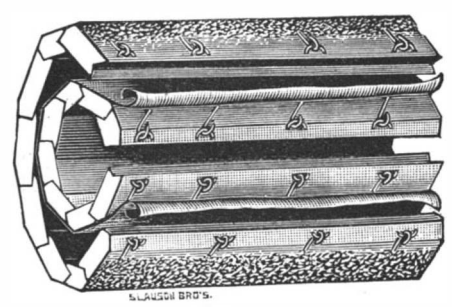


Fig. 3.

THE WYCKOFF STEAM PIPE CASING.

galvanized steel wire, then wrapped with two thicknesses of heavy corrugated paper, after which another casing of staves is put on the outside and wound with galvanized steel wire. The outer casing is then coated with asphaltum. Fig. 1 represents a section of such casing complete, there being two staves removed from the casing as shown in Fig. 2, to disclose the lining between the inner and outer courses. To cut the casing lengthwise, where this is necessary in putting it around pipes in position, the asphalt coating is first removed, when the binding wires are cut by a file or otherwise, and their ends fastened down by a common blind staple. This allows the outside casing to be laid open, as shown in Fig. 3, a similar process being followed in opening the inner casing. Different sections of this casing are conveniently joined by cutting off, at the ends, a small portion of the inner and outer casings, whereby a lap joint is readily formed, and in calculating the sizes of casing required; proper allowance should be made for the pipe couplings.

It is said that in comparative tests of this casing with one made of solid wood, both round and square, in the same line of pipe, the sectional casing has proved greatly superior. The solid wood casing rapidly became checked, and so heated throughout as to cause material loss of heat, while the sectional casing, owing to the interposed non-conducting layers, remained perfectly cool on the outside.

This improved steam pipe casing is made by Messrs. A. Wyckoff & Son, Elmira, N. Y.

Progress of the Great Tunnel under the Hudson River.

In view of the efforts now being made to span the North River with an unsightly cantilever bridge, it is pleasant to record the progress making by the silent workers *under* that noble stream, where, burdened with a pressure of several atmospheres, they burrow their way surely to make what will be in no sense a disfiguring connection between New York and New Jersey. In a total distance of 5,400 feet, there is now complete from the Jersey shore 3,340 feet, with a progress of 10 feet per day, working with three shifts of men in 24 hours.

The last air lock is now 1,200 feet from the heading, and a new one will be placed nearer to the work. This lock will be longer, having a length sufficient to take in three loaded cars instead of the two at present. Three tracks have been substituted for two, to remove the core. Twin hydraulic elevators have also been put up for more rapid removal of loaded cars, and negotiations are pending to substitute electric transit for the cars in lieu of the patient mule. The work is now within about 800 feet of the rock formation.

What is the Temperature of Ice?

In our number for February 14 last we published the following, except that, in the last paragraph but one, an error was made which we now correct.

Authorities differ widely upon this question. A careful investigator recently made some experiments looking to a solution of this, and has sent us the following:

January 23. Atmospheric temperature + 40° F.

(1) In a block of inferior ice, full of bubbles and fissures, an auger hole was bored 6 inches deep. In the cavity thus formed a chemical thermometer was dropped, the borings being used to pack the orifice around the instrument. When fifteen minutes had elapsed, the temperature within the ice was found by aid of a lens to be + 30·5°.

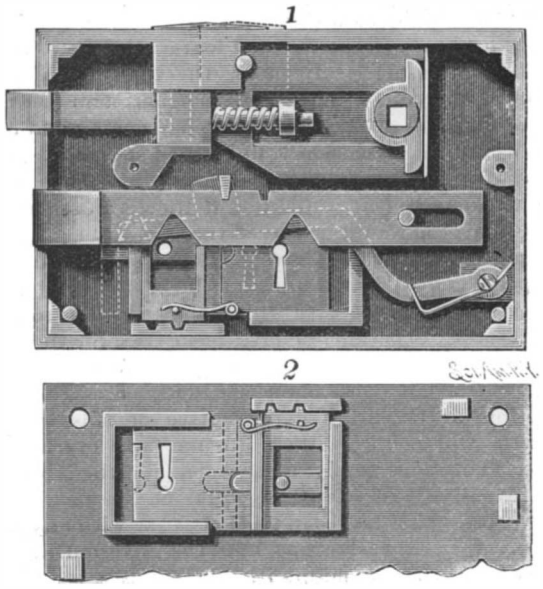
(2) Equal parts of ice and salt being mixed in a wooden pail, they formed a solution at the bottom, in which the thermometer read —10°. In the center of the pail a quart tin cup was placed, nearly full of filtered water. The cup was supported above the bottom of the pail, and in it was suspended a second chemical thermometer, while the water was allowed to freeze into a solid mass around it.

In thirty minutes the water in the cup was converted into ice. At the end of an hour and a half the relative temperatures indicated by the two thermometers had not varied, and now read, respectively: That in the freezing mixture, —5°; that in the ice in cup, 0°. These readings were taken in the office, where the temperature was 74°.

Both thermometers were carefully compared with a valuable standard instrument and with each other, before and after the experiments, and their readings were corrected for variation at different points.

AN IMPROVED LOCK.

The illustration represents a lock so constructed that it is impossible to unlock it from one side when it has been locked on the other side. Fig. 1 is a face view of the lock with the cover plate removed, Fig. 2 being an inside face view of a portion of the cover plate. The locking bolt is supported on its inner end by a pin, sliding in a slot in the bolt, on the under side of which are V-shaped notches, adapted to pass the bit of the key, the outside and inside key holes being arranged a short distance apart, in line with the notches. The bit of the key also operates on the under side of a lever, shown partially in dotted lines, and moving in a vertical slot in the locking bolt, the lever being normally pressed down by a spring. A vertically arranged plate in the casing, forming a rectangular key aperture, is fitted to slide in guideways in a longitudinally sliding plate having a key hole connected with the back of the casing, the vertical plate having a lug adapted to engage notches in a bar in the lower side of the casing. A similar arrangement is provided on the inside of the cover plate, but the positions of the movable plates are such that when the bolt is thrown out, the key aperture of one of the plates registers with its proper outside key hole, and that of the other is disconnected from its key hole, and *vice versa*. The latch, shown in the upper part of the lock casing, has a notched shank and a spring-pressed sliding head, the head being recessed to receive the inner notched



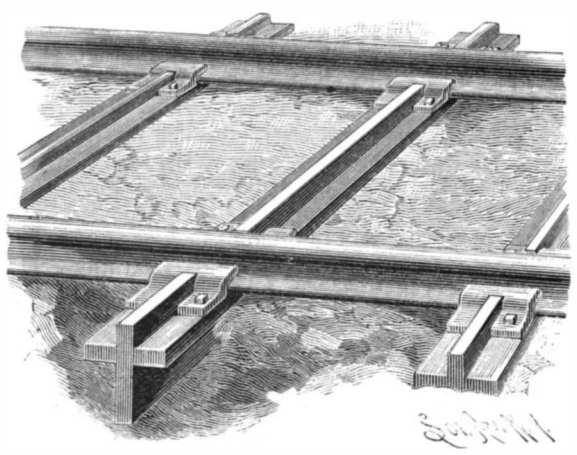
ROGERS' LOCK.

end of the shank of the latch, which may be conveniently removed and replaced at any time to turn it over when it is desired to reverse the latch.

This lock has been patented by Mr. G. T. Rogers, No. 107 Adams Street, Jefferson City, Mo.

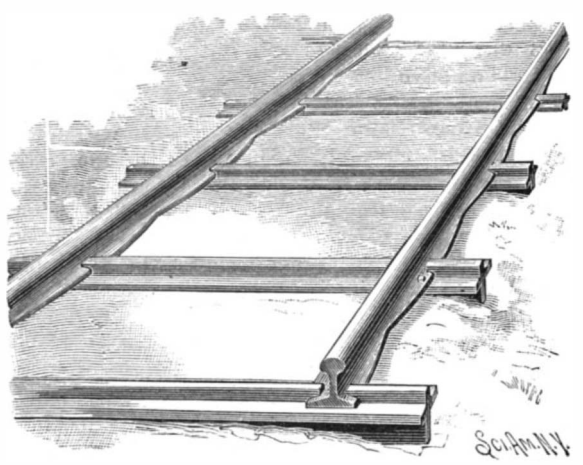
A NEW RAILROAD TIE, RAIL FASTENER, AND RAIL.

The accompanying illustrations represent improvements recently patented by Mr. Michael A. Glynn, of Havana, Cuba, designed to facilitate the laying of railroad rails, and locking them firmly in position, the tie being also readily placed in position and having some degree of elasticity, while it is intended to be inexpensive to manufacture. The tie is cross shaped in section, and the longitudinal rib above its broad portion has a slot near each end to receive a chair in which the rail is seated. The chairs have inwardly extending lugs which fit closely upon the flanges of the rails, and a broad base which rests upon the broad portion of the sleepers. The slots in the ribs of the sleepers are shaped to correspond with the



GLYNN'S RAILROAD TIE AND RAIL FASTENERS.

shape of the chairs, which are slipped into the slots from the side, thus preventing any vertical or lateral movement. A sufficient number of spikes are used in the chairs to prevent creeping of the rails. A modified form of chair is also provided, made in two parts, one to be placed on each side of the rail. The improved



GLYNN'S RAILROAD RAIL.

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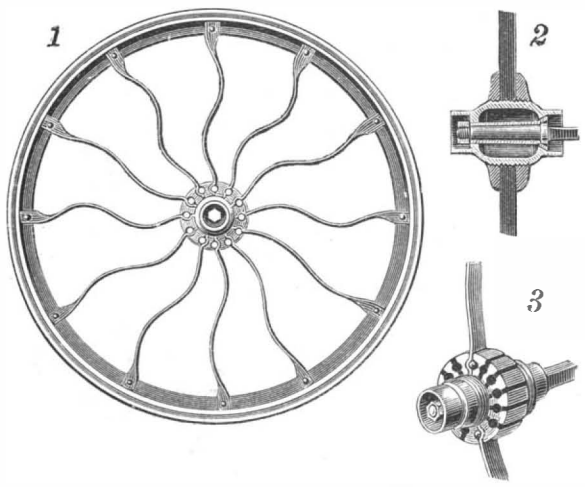
rail, which forms the subject of one of the patents, has scalloped flange, and the sleeper has a dovetailed slot just wide enough to receive the widest portion of the rail flange. When the wide portion of the rail flange is in the slot, the rail cannot be moved laterally, and the ribs of the sleepers overlap the flange to prevent all vertical motion. An occasional spike is used to prevent creeping. With this construction the rails and sleepers are designed to be quickly adjusted in position.

Further information relative to this invention may be obtained of Messrs. Perkins & Co., No. 228 Produce Exchange, New York City.

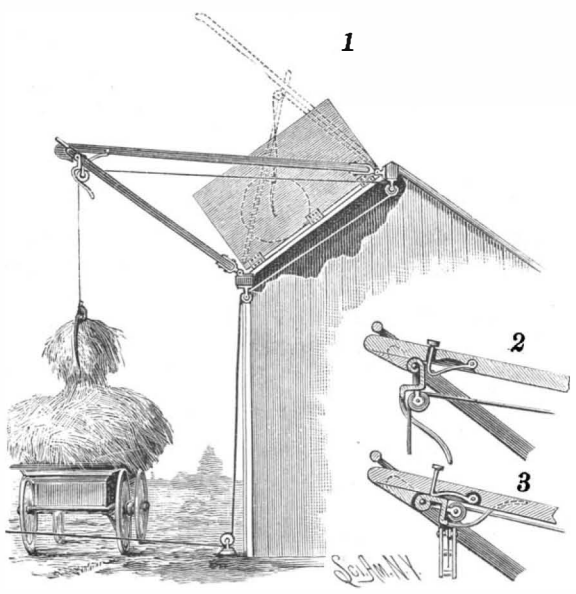
AN ALL-METAL SPRING VEHICLE WHEEL.

The wheel shown in the illustration, patented by Mr. James Carpenter, is very light, but is designed to



CARPENTER'S VEHICLE WHEEL.

be exceptionally strong and durable, having more spring than wheels made in the ordinary way, and being, therefore, less liable to wear or breakage from use on rough pavements or hard roads. The felly is T shaped, and between it and the metal tire is a thin strip of paper or similar material, making the tire set firmly, and deadening any sound which might be made in use, the tire felly and strip being united by rivets in the usual way. The wheel is thus designed to be practically noiseless. The spokes are strips of spring steel bent into reverse curves, varying according to the amount of spring desired, their outer ends being bent at right angles to form flanges and riveted to the felly, the flanges of the spoke entering mortises in the standard of the felly. The inner ends of the spokes have a semicircular bend fitting in a corresponding opening in a rim of the hub, as shown in Figs. 1 and 3, where they are made fast by bolts or rivets, or they may be additionally secured by caps or bands screwed against both sides of the rim, the outer sur-



MACHIN'S HAY STACKER.

face of the hub being screw-threaded for such purpose. The hub is cast in the form of a hollow shell, with openings for the passage of the axle box, as shown in Fig. 2, and projecting ends to protect the nut and keep out dirt. The box is slightly tapering, with the taper end on the outside, where it is screw-threaded, and the outer head of the hub is screw-threaded on the inside, for engagement with the taper end of the box, the inner head of the hub being countersunk to correspond with the flaring end of the box. With this construction, each spoke is independent of the others, and any one can be readily taken out and another inserted in its place at any time, without interfering with the other parts of the wheel, the spokes being inserted from either side of the wheel. The wheel is adapted for all kinds of vehicles, from baby carriages and bicycles to the heaviest trucks, and for heavy trucks it is claimed that no other springs will be required than the spokes of the wheels. The construction of this wheel is inexpensive, and many sets made have already had quite extended use.

For further information relative to this invention, address or apply to the inventor, rooms 97 to 101, Potter Building, No. 38 Park Row, New York City.

AN IMPROVED HAY STACKER.

A device which can be readily set up in a field, to facilitate forming a hay stack, or attached to barracks or to a barn, to lighten the labor of removing the hay from the wagon and placing it where desired, is shown in the accompanying illustration, and has been patented by Mr. Miller Machin, of Bowen, Ill. Fig. 1 shows the device applied to a barn, the dotted lines representing the parts in their uppermost position, and Figs. 2 and 3 are views of parts in different positions. On the outer end of an arm pivoted to a ridge pole or other support is a head adapted to be engaged by a tripping lever pivoted on a short transverse rod, the ends of the latter rod being secured in the outer ends of long rods or levers pivoted at their inner or lower ends on the roof of the barn at each side. On the rod carrying the tripping lever is a support for a pulley, and a rope fastened to the rod extends downward under a pulley of the head block of a hay fork, thence through the forked end of the tripping lever, over a pulley, and inward over another pulley, and down to the barn floor, where it passes under a pulley mounted to turn in suitable bearings, and is extended to be attached to a pulling gear for a horse or other hoisting power. When the fork is inserted in the hay, and the rope is pulled, the fork rises with its load until the head block strikes the tripping lever, a further pull causing the side rods or levers to swing upward and inward, and swinging upward the central pivoted arm, as shown in dotted lines. When the operator now backs up the horse, or releases the pull on the rope, the hay may be placed where desired, the weight of the parts causing the levers to swing outward again into the normal position for raising a load. This device can also be readily applied to a number of stacking poles set in the usual manner on the ground, and fastened together near their upper ends.

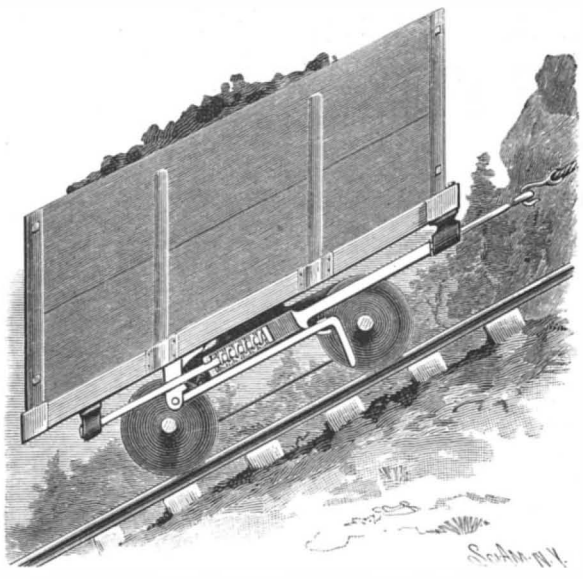
A DOUBLE COMBINATION LOCK.

The lock herewith illustrated, which has been patented by Mr. John E. Farnsworth, has a series of levers to engage and disengage the locking bolt, cams actuating the levers, and gear wheels moving the cams at different rates of speed, making possible a great number of changes and preventing the opening of the lock without knowing the combination. As shown in Fig. 2, which represents the lock with the front plate removed, the locking bolt, B, has rack teeth on its under side meshing with a gear wheel, C, on the knob spindle, which has an indoor and an outdoor knob. At the inner end of the bolt is a plate, B^2, adapted to travel on top of a series of levers, one of which is shown at F, and all fulcrumed on a pin, A', the under sides of the levers being curved and adapted to ride on the peripheries of the cam wheels, E', F, G', Fig. 3, one of the cam wheels being shown in Fig. 6. The cam wheel, E', turns loosely on a shaft, H, extending through the casing and carrying pointers, H', and indicating on dials, I, Fig. 1, on the inside and outside of the casing. On the face of the cam wheel, E', is a pinion meshing in a gear wheel on the shaft, J', the gear wheel being connected by a pinion and sleeve with spindles, carrying each an inside and outside knob, while on the shaft is another gear wheel operating the pointer, L^2, on the dial. On the shaft, J', are also pinions, one of which meshes into a gear wheel of the cam wheel, F', and connected with the pointer, F^4, of the dial. As shown in Fig. 1, the combination is 15-30-45, the pointer, H, being shifted only in the direction of the hands of a watch. When the knobs controlling the other pointers are moved in an inverse direction, one pointer moves faster than the other, owing to their being connected to the pinion by differential gear wheels. The bolt being in the innermost position, and the operator turning these knobs backward, the outward movement of the bolt is then prevented, and the other knobs cannot be turned. The bolt cannot be moved until all the pointers have come to their proper position. In order to change the combination the operator removes the front plate or the entire lock from the door and shifts the sets of pointers, care being taken to move the two pointers of each set, for the inside and outside dials, to the same numeral desired to form part of the combination.

Further information relative to this invention may be obtained of Messrs. Farnsworth & Williams, Bazine, Kansas.

A SAFETY DEVICE FOR INCLINED ROADS.

The device shown in the accompanying illustration is adapted for attachment to passenger cars as well as for other purposes, to give greater security in moving cars up and down an incline, only one cable being required. It is a patented invention of William Peach, M.D., of No. 76 Monterey Street, Allegheny, Pa. On the under side of the frame of the car is a sliding draw-



PEACH'S SAFETY DEVICE FOR INCLINED ROADS.

head, with a link to which the power cable is attached, and two rearwardly extending bars connected by a cross bar. Passing through this cross bar is a rod whose rear end is attached to the frame of the car, the other end of the rod being attached to a crosshead sliding on the rearward extensions of the drawhead. A spiral spring on this rod holds the drawhead back when there is no strain upon it. Hinged in bearings beneath the car is a U-shaped bar, whose side members have each a downwardly projecting hook, adapted to engage a cross tie of the track. These side members are connected by a cross bar, which rests in a hook on the under side of the sliding drawhead when the latter is drawn forward by the cable, the side hooks being then held up as shown in the illustration. A stop on the under side of the drawhead limits the distance it may be drawn out, but when the strain is removed, by the breaking of the cable or other accident, the spring causes it to be instantly drawn backward, permitting the hooks to drop between and clutch the cross ties of the track, stopping the car at any point where the accident occurs.

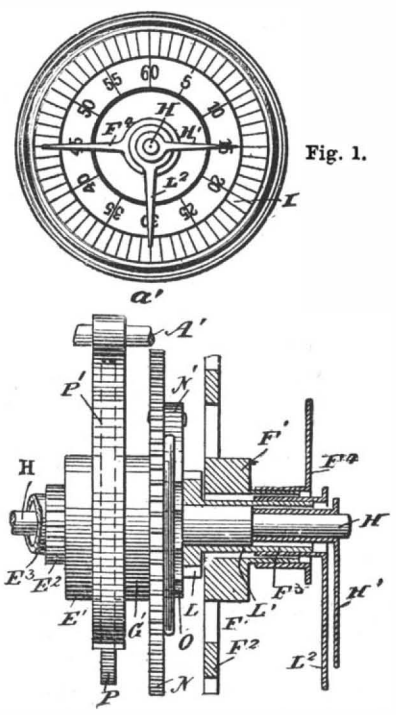


Fig. 1.

Fig. 3.

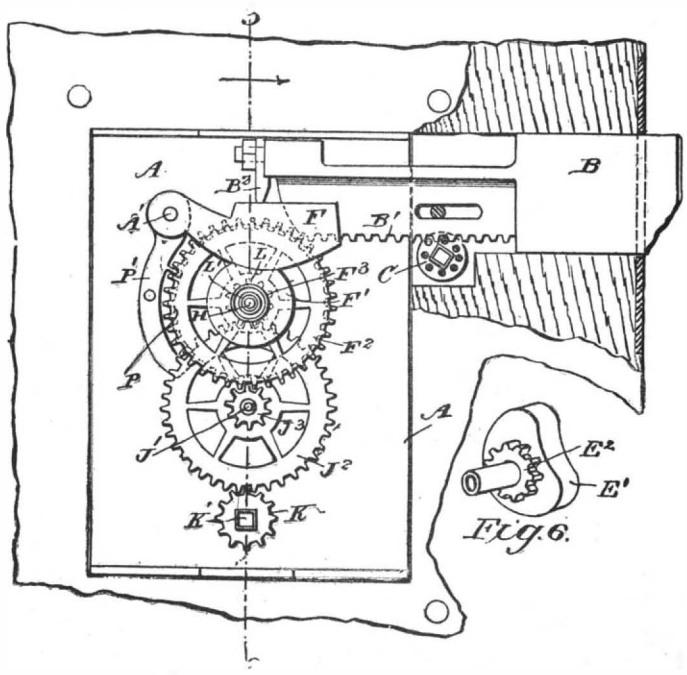


Fig. 6.

FARNSWORTH'S COMBINATION LOCK. Fig. 2.

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Newport, Kentucky, Aluminum.

In a sheet issued at Newport, Ky., styled the *Aluminum Age*, is a statement saying that a representative of the SCIENTIFIC AMERICAN witnessed some very interesting experiments showing what "the new aluminum process" is capable of producing in the shape of wrought iron steel castings, at the aluminum works, Newport.

After making this false statement—false because it is untrue that a representative of the SCIENTIFIC AMERICAN has visited the Newport works or witnessed experiments as stated—the writer goes on to give a detailed account of the pretended experiments, saying that the furnace was charged with coke, scrap, aluminum alloy and a secret paste, which were melted, and from which wonderful castings were made, etc. Various other details are then given, which are garbled from an article published in *Industries*, of London, relating to Brin Brothers' establishment in that city, which was quoted in the SCIENTIFIC AMERICAN of November 10, 1888, p. 296.

The Perfume Industry in the United States.

During the recent development of horticulture in Florida and California many experiments have been made in the production of perfumes from flowers, and many of these have resulted successfully. There is little wonder, therefore, that inquiries are often made as to the possibility of growing flowers at a profit for manufacturing purposes in the genial climate of these and other States. Many of these inquiries are evidently from persons who have not even a vague idea of the result to be arrived at, not to speak of the details to be pursued, so that perhaps a few hints from one familiar with the products may be useful. Despite all the triumphs of modern chemical science, which has produced synthetically many odors which are more or less useful, it still remains the fact that all high class floral extracts, by whatever name known, are composed, to a greater or less extent, of one or more of the following odors: violet, rose, jasmine, acacia, orange, tuberose, and jonquil. With one or more of these in combination with some resins, oils and animal secretions, the skillful perfumer is able to imitate the odor of any other flower and produce pleasing bouquets. These odors are bought by the perfumer in the form of pomades, experience having taught that this is the only feasible means of securing them properly. Practically, then, our citizens have this problem before them very clearly, namely, to produce a highly charged pomade at a price which will enable them to compete with the flower farmers of Southern France, who at present supply the world's markets. This pomade is marketed in eleven and twenty-two pound tins, varying in price according to quality. It pays fifty per cent duty, and the present wholesale price is about $2.50 per pound for violet, and $1.50 to $1.65 for the others.

Like all manufactures, the making of pomade cannot be taught by books, but a few hints may help the experimenter. The process of extracting odors is known as *enfleurage*, and it is carried on either with or without heat. Jasmine and tuberose flowers are exposed to lard spread thinly on sheets of glass in suitable frames; this soon absorbs the odor, and by renewing the flowers the grease becomes saturated. The perfume of the other flowers is extracted by hot *enfleurage*. In this case an addition of beef fat is made to the lard (insuring a higher melting point); this mixture is heated to the melting point, when the flowers are thrown in and rapidly stirred through the grease; the semi-liquid mass is put under a strong press with suitable filtering material until the flowers are separated. The process is continued till the grease is practically saturated with odor. These processes are simple, and with a supply of flowers there is no reason why a good pomade cannot be produced in this country.

Judging from some inquiries, however, it does not seem to be generally understood that the process depends primarily on securing perfectly pure and odorless lard, which is by no means the same as the lard of commerce. No amount of perfume will make impure grease fragrant, and the perfumer will not buy an article of the kind at any price. In his laboratory the perfumer is one of the most practical of men, and buys his materials on their merits. It is just as important to have his pomades free from false odors as that his spirits should have no trace of fusel oil.

The process of securing lard free from albumen, membrane and blood, is as follows: Cut up the fat in small portions, separating the membranes as far as possible by hand, and wash till the water runs clear. Melt with a gentle heat in an iron or copper vessel over a water bath and continue till it becomes anhydrous, or free from water, which may be known by its becoming perfectly clear. Finish by filtering through a clean cloth. This lard will retain an odor which may be removed by remelting and adding a small portion of alum or common salt, and keeping it over the fire till a scum rises, which should be skimmed off. The salt must then be washed out and the lard again rendered anhydrous. Such lard is kept in a moderate temperature in tin, sealed from the air, and it will remain sweet as long as is usually necessary.

It will be well for one who intends to try the perfume industry to secure a sample of the French pomade from some perfumer, so that an idea may be had of the strength of odor desired in the market. The prospect of success offered by this industry can only be learned by experiment, but it is certain that no careless methods will answer. As in other things, there is room at the top, and high class products are certain of a market.—*J. N., in Garden and Forest.*

AMPERE AND VOLT ANALOGIES.

T. O'CONOR SLOANE, PH.D.

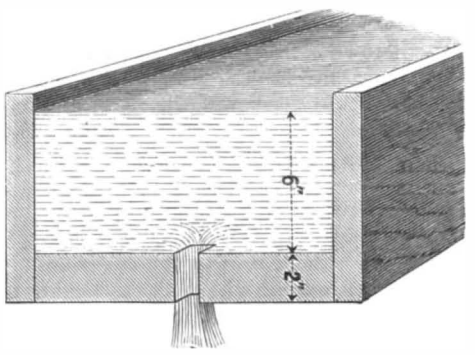
In the SCIENTIFIC AMERICAN of February 28, 1891, page 133, a graphic illustration of the volt and ampere was furnished in an extract from some testimony given by Thomas A. Edison. He invoked the waterfall as the representative of a current of electricity, compared its height to voltage and its volume as so many gallons per second to amperage.

This illustration, while admirably suggestive to the popular mind, is not exact, because it appeals to an absolute quantity of water and to a time unit in obtaining the analogy to an ampere.

It is unquestionable that no analogy for an electrical unit can well be perfect, but it so happens that for the ampere a peculiarly close analogy is found in a very well known water measurement unit, namely, the miner's inch. It is upward of a year ago that the writer described this analogy in the columns of this paper. It is one that must have often impressed electricians.

The miner's inch is defined as the quantity of water which will flow through an aperture an inch square in a board two inches thick, under a head of water of six inches. Here, as in the case of the ampere, we have no reference to any abstract quantity such as gallons or pounds. There is no reference to time. It is simply and purely a rate of flow, exactly what the ampere is conceived to be in electricity.

In the illustration a representation of a tank whence



water is flowing through a hole one inch square extending through a two inch plank, and under a head of water of six inches, is shown. The perforated plank is shown as horizontal, simplifying the pressure question. Referring to these conditions, we may consider the head of water, six inches, as the representative of electrical pressure; in this case representing one volt. The aperture restricting the flow of water may be assumed to represent the resistance of one ohm; the flow through a resistance of one ohm under the pressure of one volt is of course one ampere; the flow through the resistance of a one inch hole two inches long under the pressure of six inches to the upper edge of the opening is one miner's inch.

The expression "one miner's inch per second" would be just as meaningless, or at least redundant, as the expression "one ampere per second." On the other hand, the miner's inch-second is the correct analogue to the ampere-second; the one denotes a specific quantity of water, 0·194 gallon; the other a specific quantity of electricity, a coulomb; 0·194 gallon per second of flow represents a miner's inch; one coulomb per second of flow represents one ampere; 1·94 gallons per second is supplied by ten miner's inches; 10 coulombs per second is supplied by 10 amperes.

If we attempt to apply Ohm's law to the miner's inch, we naturally fail, because the laws of hydraulics differ from those of electricity, but none the less it is a very excellent analogy, and one which is of importance in conveying the idea of rate of flow.

The same idea could be carried out in application to power. Into power the idea of time does not enter. We can have a horse power-second of work, but one horse power per second means nothing more than one horse power. Accordingly, for electric power the unit is the volt-ampere; for work, the volt-ampere-second or volt-coulomb. In the same way we might take the foot-miner's inch as the unit of power. Then the foot-miner's inch-second would be the corresponding unit of work.

Besides the miner's inch there is a similar unit, the water-inch, which is equally applicable to this line of explanation.

It curiously happens that the absolute quantity of water is sometimes spoken of in miner's inches. When thus used, a miner's inch flowing for 24 hours is meant, carrying out the precise idea of coulombs as a measure of quantity of electricity.

Proposed Irish Channel Tunnel.

In the paper on this subject which was read by Sir Roper Lethbridge, M.P., before the Society of Arts on February 11, the author stated that, if such a tunnel were ever to be constructed, it must be with the aid of the state as a public work of national importance. Two or three schemes had already been propounded, and last October the mayor of Belfast, Mr. Barton, placed before a meeting of his fellow citizens a scheme which seemed hopeful for a tunnel between Island Magee and the coast of Wigtownshire.

Another proposal is for a tunnel between Whitehead and Portpatrick, while a third, by way of Cantyre, adopts a shorter sea route, and a fourth has been suggested between Donaghadee and Portpatrick. Another ingenious device proposes a submerged tubular bridge, and a channel bridge on the lines of the Forth Bridge has even been talked of. Judging by what has been done by Sir Edward Watkin at Dover, there seems little doubt that a submarine tunnel could be constructed—it was simply a question of cost and time.

After quoting Professor Hull's report on the geological conditions of the channel bed, Sir R. Lethbridge proceeded to consider the question of cost, coming eventually to the conclusion that a sum of £10,000,000 would probably be needed. In order to make a tunnel pay, it would be necessary to earn about £200 per mile per week, and therefore extraordinary sources of revenue would have to be sought. He ventured to suggest three that might be obtainable: First, the railways connected with the tunnel would be largely benefited, and therefore might be called upon to contribute *pro tanto*. Secondly, the whole line of country between the Irish end of the tunnel and the western coast, in view of new transatlantic routes, would be enhanced in value, and on the principle of "betterment" might be expected to contribute. Thirdly, the work being one of national importance, Parliament might come to its aid. In view of the proposals for opening a new route to China, Japan, and Australasia across British North America, Ireland would eventually become the last section on the side of the Old World of the great British trade routes girdling the world. Any project, therefore, for closer intercommunication between Great Britain and Ireland must be worth attention, to say nothing of the advantages that would be conferred upon the sister isle by making it more easy of access to travelers, whether for pleasure or profit.

In the discussion which followed, Sir Edward Watkin said he was especially interested in the question, because he had for many years been considering the feasibility of uniting Ireland with Scotland, and bringing the west coast of Ireland within three and a half or four days' reach of America. He had contemplated a ship canal between Dublin Bay and Galway Bay, which the late contractor, Mr. Walker, told him might be cut for about £8,000,000.

Sir Joseph W. Bazalgette.

The death is announced from London of Sir Joseph William Bazalgette, the eminent civil engineer. Though born at Enfield in 1819, he was of French origin. He was educated in the private schools of England and subsequently became a pupil of the distinguished engineer Sir John MacNeil. He began business on his own account as a civil engineer in London in 1842, and four years later attained wide celebrity in connection with the great railway extensions of that period.

As assistant engineer to the Metropolitan Commission of Sewers, which appointment he accepted in 1848, he designed and constructed over three hundred miles of sewers in London, and on the passage of the Metropolitan Management act, four years later, he was appointed by public competition engineer to the Metropolitan Board of Works, in which capacity he devised the scheme for the drainage of London which was carried out between 1858 and 1865. This achievement, together with the introduction of subways for carrying the gas and water pipes and telegraph wires under the new metropolitan thoroughfares, which he constructed, gave him a world-wide reputation.

In addition, Sir Joseph also designed the Victoria, the Albert, and the Chelsea embankments on the Thames, executed between 1863 and 1874, together with numerous street improvements. A code of regulations and instructions on the construction of bridges and alteration of streets within the metropolitan area was published by him, which is incorporated into all metropolitan railway bills. In 1871 he was created a Companion of the Bath and knighted by the Queen at Windsor Castle, May 12, 1874.

ONE of the features of the grand parade in Des Moines during the Iowa State Fair was an electrically propelled buggy, the current being furnished by storage cells.

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Animal Photography.

A lecture on "Wild Animals in Captivity" was recently given in London by Major J. Fortune Nott, president of the Richmond Amateur Photographic Society. The lecture was illustrated by the beautiful slides made by Major Nott from negatives taken by himself in the Zoological Gardens and other places, and was attentively listened to by an audience which filled the hall.

Major Nott prefaced the exhibition of the slides by some remarks on the attraction which the sight of wild animals in captivity had exercised on all civilized nations from the earliest times. Portraits of the camel, which, although one of the earliest of domesticated animals, still remained the same as it had been in the time of the patriarchs, and showed no signs of increasing intelligence, as had been the case with horses and dogs, were thrown on the screen. Two very interesting pictures were those of a camel and its young one, found by an English officer on one of the Egyptian battlefields, wounded, and apparently dying. The officer determined to try to save the lives of the animals, and had them shipped to the Zoological Society, in London. When they arrived they were nothing but skin and bone, their humps had entirely disappeared, and they could not walk. So bad was their case that permission to kill them was sought by telegram. The telegram, however, fortunately miscarried, and during the delay that ensued the camels began to recover, and their portraits as they appeared when landed and as they are at present provoked great applause.

Among the finest of the pictures were those of the lion, tiger, panther, giraffe (one of which showed the animal as seen directly in front, and enabled the extraordinary length and thinness of the neck to be well seen), hippopotamus, rhinoceros, kangaroo (with young one peeping out of the pouch), deer of several species, seal, sea lions, monkeys (including a portrait of Sally, who can count, and objects to take her tea unless offered in a cup and saucer), buffalo, wild asses, and zebras.

Major Nott gave interesting details of each of the animals as it was shown, and mentioned in the case of the sea lion, which is said in most of the school text books *not* to be so called because it has a mane, that this was evidently wrong because the specimen he had photographed showed the mane clearly. This was owing to the fact that the animal had been some time in the sun and the mane had dried. When wet it was hardly perceptible.

A photograph of a curious picture of a rhinoceros by Albert Durer, dated 1515, was shown. This was taken from an engraving in the British Museum, and bore on it an affidavit (as it would now be called) that the portrait was from life.

It represented an animal remotely resembling a rhinoceros, but clad in a complete suit of what looked like plate armor richly ornamented. This provoked much applause, and Major Nott stated that so much faith was placed in this affidavit that the pictures of the rhinoceros in all books since the date of Durer's engraving were copied from it down to a very late period.

The Destruction of Two Gasholders at Glasgow.

One of the most remarkable occurrences on record, in connection with gasholders, took place, says the *American Gas Light Journal*, at Glasgow, on the 15th ult. The gas undertaking of this important city is the property of the municipal authorities, and comprises three different stations. The one in question, known as Dawsholm, is situated in a somewhat isolated position outside the town, and includes three gas holders arranged in line, about 25 feet apart, but fortunately, as it turns out, at some little distance from the rest of the buildings and plant. The three gasholders are all similar in respect to diameter, being 160 feet across. Two of these have lately been enlarged by the addition of a third lift, which made them 90 feet in height, and equal to containing more than 1,500,000 cubic feet of gas each. The third remained a double lift, consequently about 60 feet high and holding something over 1,000,000 cubic feet of gas when full.

At about 4:30 in the afternoon the outlet valve of No. 1 was open for the supply of the district, No. 2 shut off, and the inlet of No. 3 was open to receive the make of gas. The valve man, McAlister, opened the inlet of No. 2, with a view apparently of diverting the make from No. 3. At this time No. 1 was three parts or more full, No. 2 a little less, but sufficient to cup the lower lift, and No. 3 was not far from being full. Before McAlister could complete his purpose by closing No. 3 inlet a large mass of flame was observed shooting high into the air, over the roof of No. 2, the center holder. It was accompanied by a loud rumbling noise like the shock of an earthquake, together with a concussion that caused windows to rattle violently, and greatly alarmed the inhabitants of the neighboring part of the town. This appears to have been caused by the bursting of the roof of the gasholder in all parts. It was quickly followed by the destruction, with a second concussion, of No. 1 holder, and in a few minutes the whole structure of both holders lay in a confused mass at the bottom of the tanks. Fortunately this was unattended with loss of life or even serious injury. Workmen who happened to be in the vicinity were scorched, and some haystacks 100 yards off were set on fire; but the enormous volume of some 3,000,000 cubic feet of gas appears to have passed steadily up into the air, and burnt away as fast as it could meet with sufficient oxygen to support combustion. The whole affair was over in four or five minutes.

The experts report they are satisfied that the holders did not contain any explosive mixture, nor did they possess structural defects. But there were "indications of an explosive material having been placed on the crown of No. 2." The explosive power, striking inward, ruptured No. 2, and the concussion was considered sufficient to account for the damage to No. 1. The "indications" appear to be an irregular fracture, having the edges bent *inward*, and corroded as if by the action of chemicals.

The corporation have offered a reward of £1,000 for the apprehension of the author of the catastrophe.

Sorting Letters at Sea.

The establishment of ocean post offices, similar to the railroad service, has been approved by the government, and will be adopted between the United States and Germany. By this plan postal clerks on the ocean steamers plying between New York, Bremen, and Hamburg will have ample time to assort the mails, so that upon the arrival of the steamers the letters can be promptly forwarded to their destination. The expense of this ocean mail service is to be equally divided between the two countries. The new arrangement will go into effect April 1 on vessels leaving the German ports on that date and on April 15 for outbound vessels from New York. Should the plan prove satisfactory, there is no doubt that it will be adopted in the postal intercourse between the United States and other countries.

UNIVERSAL FILE HANDLE.

This malleable iron file handle has just been placed on the market by the Millers Falls Company, 93 Reade

UNIVERSAL FILE HANDLE.

Street, New York City. It is five inches long, japan finish, and weighs five ounces. Thumbscrew of forged steel, strong and durable, and will hold perfectly files of all sizes and shape tangs, from a 15 inch mill file to the smallest size in use. It holds equally well twist drills, screw drivers, auger bits, gimlets and all tools having shanks less than ⅜ of an inch square.

A Chance for the Inventor.

The wonderful ingenuity developed by our mechanics, inventors, and contrivers during the past generation or two has about spoiled the dear public. It does not make much difference as to the purpose for which any piece of mechanism is designed, it must be more or less automatic and "self-operating" to take with the average buyer. In some respects the demand —craze we might call it—has been carried to the verge of absurdity; in others it has proved of the greatest benefit to the human race, while certain fields, in which the automatic principle should be peculiarly available, have failed of all benefit in the efforts of the inventor.

Take for instance the ordinary heating apparatus in our dwellings, whether it be steam, hot water, or warmed air that is employed. Many of the makers thereof have strong claims to advance for the "automatic" character of their appliances, and yet there is not one among them all that can be safely trusted, to use a homely phrase, to "go it alone," even for a limited period. Here is a furnace man who will fit up your residence with a wonderful arrangement of electric thermostats, or thermometers having electric limit connections, by which he will guarantee to keep your house at an even temperature all winter. A steam heating outfit is provided with a diaphragm valve that controls the damper of the furnace and keeps just so much pressure, which means an equally well determined degree of heat. The hot water man has something else; all are equally infallible, but the only difference in their operation is the effect they exercise on the pocketbook. Either they are dismal failures, in spite of all that can be done for them, or they take so much looking after that the deluded purchaser reverts after all to the poker, shovel, and shaker, which, controlled by the human sense of comfort and its opposite, are the best regulators of the modern heating apparatus.

Here is a chance for the inventor. The ingenious individual who will make it impossible for the ordinary heating apparatus to freeze us or "render" us out between bedtime and dawn; that will insure, without a constant worrying of the fires, an even temperature; that will obviate the necessity for flooding the ordinary residence with cold air and incidentally with dust, preparatory to the kiln drying of its contents, will win a fortune and honestly earn it. It does not matter what the heating medium may be or how regulated, provided it is not in any way more offensive, cumbersome, dangerous, etc., than the methods now in vogue; as long as it is reliable and effective it will go, and price will be no object.

There is no doubt but what it will come to pass that the heating apparatus of the future will be as economical of fuel, as safe, as efficient and withal as mechanically beautiful, as the modern automatic high speed steam engine, with its cut-off and perfect self-governing devices, and inventors would find it mighty profitable to be first to the front with anything of the kind that would be really trustworthy. We have looked the field over very carefully, and found several contrivances that may ultimately fill the bill, but which labor under "just one" little defect or weakness that is fatal to their perfect reliability. With all the ingenuity they have thus far displayed in their constructions, the originators should certainly be able to complete them. —*The Sanitary Plumber.*

Electricity as a Measure of Thought.

Mr. J. L. Balbi says: It is well known to the medical profession that every mental effort causes a rush of blood to the brain, and that the amount of blood depends on the "intensity" of the thought; but rush of blood means a rise in temperature, and if we could measure this we would be able to determine, in a *rough* way, the "power" necessary for the generation of any thought or mental effort. I accomplish this object in the following manner: I have a head gear of some light, high-conducting (heat) substance. In its middle or any other convenient position I fix a thermo-electric pile, and connect this, by means of flexible wires or otherwise, to a sensitive galvanometer. The extreme sensibility of the thermo-electric pile is well known, and therefore whatever rise in temperature takes place, consequent to the rush of blood, would be instantaneously indicated by the galvanometer. The utility of such an apparatus may not appear at first sight of great importance, but if we consider for an instant the facility or difficulty with which children at school learn their lessons, any doubts we may have entertained as to its practicability will be immediately dispelled. By such a contrivance would we ascertain the "brain power" of boys and girls, nay, even men, and thus be in a position to indicate in what direction their mental efforts ought to tend.

To Relieve an Overworked Brain.

A Swiss doctor says that many persons who extend their mental work well into the night, who during the evening follow attentively the programme of a theater or concert, or who engage evenings in the proceedings of societies or clubs, are awaked in the morning or in the night with headache (the *Sanitary Inspector*). He is particular to say that he does not refer to that headache which our Teutonic brethren designate *Katzenjammen*, that follows certain convivial indulgences. This headache affects many persons who are quite well otherwise, and is due in part to the previous excessive work of the brain, whereby an abnormal flow of blood to that organ is caused; in part to other causes, for example, too great heat of rooms, contamination of the air with carbonic acid, exhalations from human bodies, and tobacco smoke.

For a long while the doctor was himself a sufferer from headache of this kind, but of late years has wholly protected himself from it by simple means. When he is obliged to continue his brain work into the evening, or to be out late nights in rooms not well ventilated, instead of going directly to bed, he takes a brisk walk for half an hour or an hour. While taking this tramp he stops now and then and practices lung gymnastics by breathing in and out deeply a few times. When he then goes to bed, he sleeps soundly. Notwithstanding the shortening of the hours of sleep, he awakes with no trace of headache. There exists a clear and well-known physiological reason why this treatment should be effective.

Influence of the High Tension Spark.

Mr. Branly has recently found that the spark of a Holtz machine or induction coil has a remarkable effect in temporarily decreasing the resistance of certain badly conducting mixtures, such as powdered or oxidized metals, or pastes formed by immersing filings of iron, copper, or other metals in a non-conducting fluid. The effect is generally increased by connecting one or both of the sparking terminals with the substance under test, although the spark alone may be sufficient. In one case the resistance of a junction of two pieces of oxidized copper, as measured by a Wheatstone bridge, was reduced from 80,000 ohms to 7 ohms in this way. The diminution of resistance of such conductors may last for as long as 24 hours, unless the substance is disturbed by vibrations, in which case the high resistance is restored.

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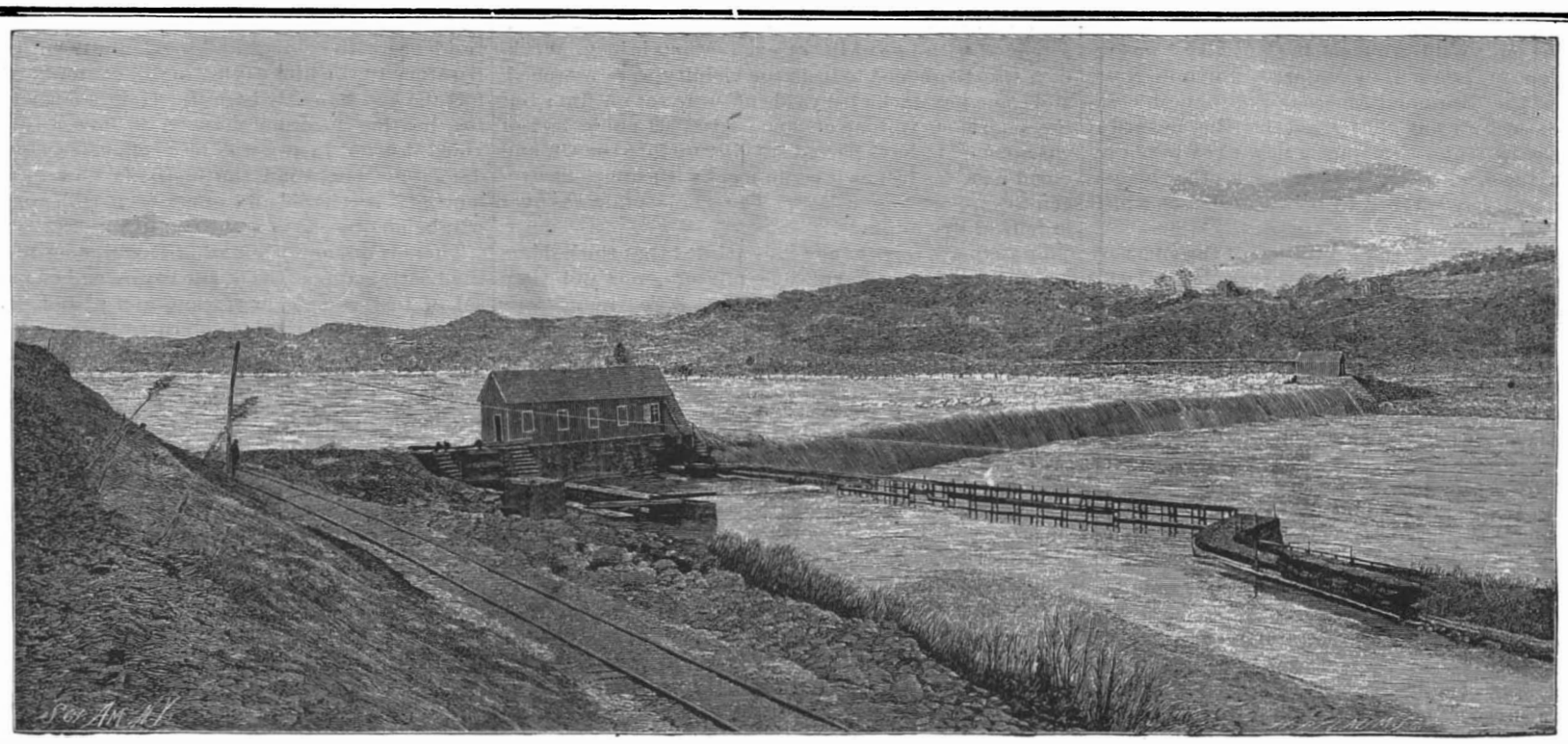


THE GREAT DAM OF THE HOUSATONIC RIVER, AT SHELTON, CONN.—BEFORE THE BREAK.

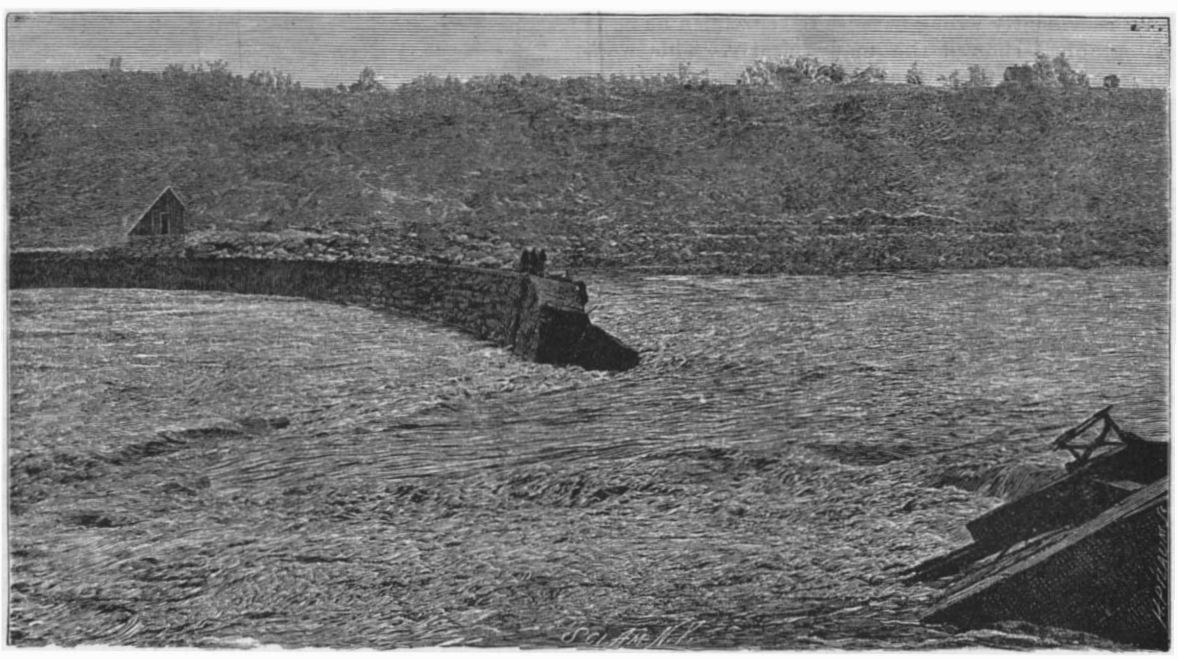
DESTRUCTIVE WINTER FLOODS IN CONNECTICUT.

On January 11 and 12 there was a sudden rise in the Housatonic River, Connecticut, from continued rains which had swollen the tributary brooks, and the heavy ice which had formed in the river was suddenly broken up with great violence, the greater portion of the ice in the channel being carried away in a few hours. The Housatonic occupies a considerable channel and drains a wide area in western Connecticut and Massachusetts. One of our views shows the state of the river after the ice had broken up, and the great dam which crosses it between Birmingham and Shelton, just before its junction with the Naugatuck. The dam was built in 1870, and was 637 feet long, with about 75 feet of abutments, all built in the most solid manner, and it was not considered that the structure was much injured by the ice, although the railroad bridge below was seriously damaged, as shown in one of the views. Besides the damage to the bridge, ice was piled several feet high on the railroad tracks, and travel was delayed for several days.

The river continued to rise until, on January 28, it had reached a height said to have been unprecedented within a generation. On that day the dam gave way and a great portion of the railway bridge was entirely destroyed, as shown in our views, made from photographs taken a few hours after. The break in the dam occurred just after seven o'clock in the evening, and an alarm was given by employes in the paper mill, an alarm gong in which was continuously sounded for a long period, the engineer, in fact, tying down the connections to prolong the note of warning, and making a rapid flight. There was great excitement in the entire neighborhood, all hurriedly retreating from what it was feared would be a most disastrous flood; but there were no lives lost and the damage was confined to the destruction of property.

The injury to the dam proper consists in the sweeping away of about 125 feet of its easterly end to the foundations and the destruction of the massive abutment gates and gate houses to the easterly canal of the Ousatonic Water Company. The abutment walls, with the machinery for hoisting the gates, and the gates themselves, were toppled over in a solid mass, and there was also a washout of nearly two acres of land from the river bank below. At the time of the collapse there was about seven feet of water pouring over the face of the dam, but the water gradually subsided as the breach widened, until the whole volume of water poured through the opening.

The giving way of the dam is primarily attributed to damage caused by the ice. It is supposed that the wooden apron on which the water and ice strike as they pass over the dam was badly broken and impaired when the ice in the river broke up, and that continuous undermining and washing out followed until the final break. Just before the completion of the dam, in 1869, a freshet greatly damaged it, so increasing its cost that it is said the investment of the water company in its construction has not been a paying one until within the past two or three years. Many manufacturing industries, however, have grown up in the vicinity on account of the advantages afforded by this water power, and the dam will be rebuilt as speedily as possible. Many of the manufacturers are already partially supplied with steam power, so that their business will not be wholly interrupted, and others are putting in engines. One paper manufacturer, whose work is interfered with, has a contract with the government postal department, the contract itself providing that an engine must be put in if the water power should give out.



THE BREAK, LOOKING UP STREAM.

THE BREAK, LOOKING DOWN STREAM.

The plans for the rebuilding of the dam have not yet been completed, as, owing to the continued high water, the engineer has not been able to ascertain the exact condition of the work left standing of the old dam. A temporary coffer dam is, however, being put in, consisting of a trestle work of piles, as shown in one of our illustrations, to be filled in with rock on one side and dirt on the other. Mr. L. S. Brinsmade, of Birmingham, is the engineer in charge of the work, and Mr. F. A. Rivers, of Holyoke, Mass., has charge of the piling. The rock filling is obtained from a quarry near by, being run in by gravity power from a location so convenient that it requires only about ten minutes for a car to go from the quarry to the trestle, unload, and return.

Perhaps the most serious inconvenience caused by the floods is the destruction of the Housatonic Railroad bridge. It is estimated that the loss of this structure alone will cost the company $50,000, besides the serious item from loss of traffic. The main part of the bridge consisted of iron trusses supported on solid stone piers. This was connected with the land by a long trestle.

On Monday, January 12, the sudden rise in the river broke up the ice, as explained above, and moving cakes were floated down upon the rather frail trestle work of

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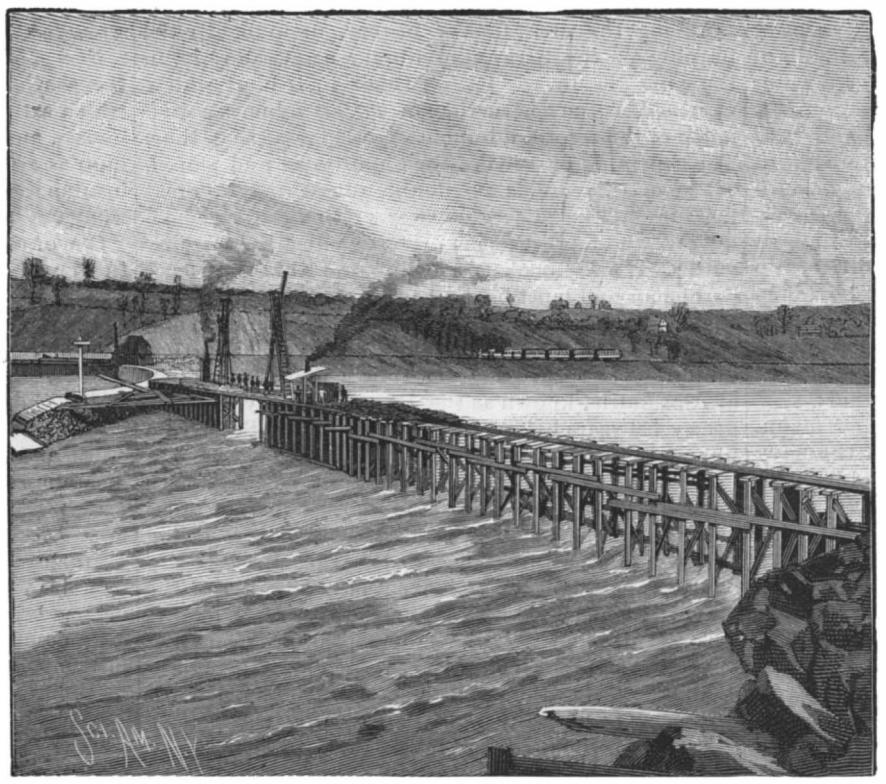
the bridge, where it became jammed, until, finally, the pressure of ice and water became so great that the spiles were carried away, and an opening about 100 ft. long was made, leaving nothing but a string of ties and rails that hung in mid-air from the remaining supports. Later another row of spiles 100 ft. long was swept away from the eastern end of the bridge. The work of destruction went on until the railroad track was left suspended in a most fantastic manner upon the few spiles that had resisted the force of the elements. The work of reparation had progressed but slowly when, on January 28, the second flood occurred, with the carrying away of the dam.

The destruction of the trestle work was completed, and this portion of the bridge became a complete wreck. The force of the water and ice in the first instance was sufficiently great, as may be seen from the engravings, to undermine and partially overturn the stone pier at the eastern end of the iron work. A few daring ones, when the raging torrent was at its worst, entertained the curious spectators on the banks by crossing over the wreck as it swung on its flimsy supports. For information received our thanks are due Mr. C. E. Meservey, of Birmingham. Our engravings were prepared from photographs taken at the time of the disaster.



CONSTRUCTION OF THE TEMPORARY DAM.

The Inventor of the Siphon Pressure Gauge.

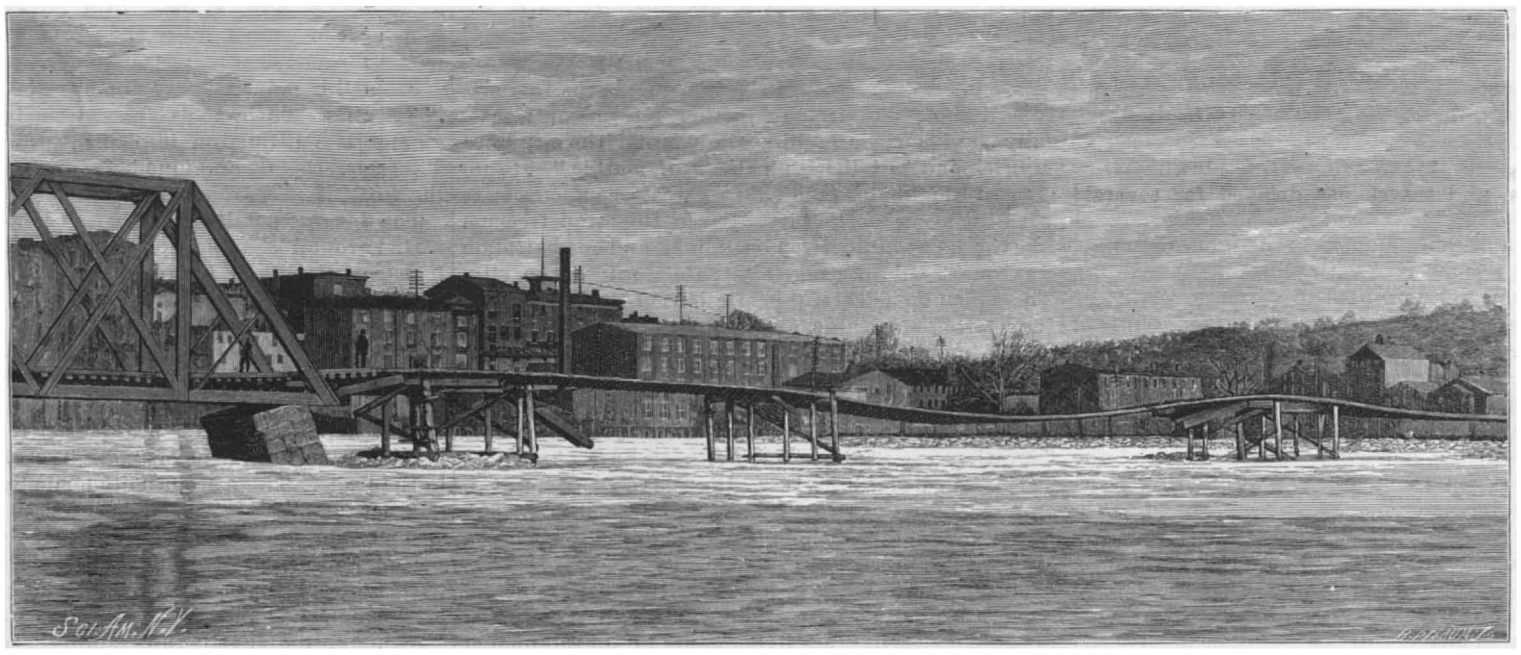
The common gas pressure gauge, in which water in the lower half of a U-shaped glass tube is exposed to the pressure of the atmosphere on one side and to that of the gas on the other, is such a beautifully simple and efficient instrument that its origin is seldom if ever thought about by those who use it most. According to a communication to *Nature* on the subject of anemometers, by Mr. W. J. Lewis, this kind of gauge is generally supposed to have been devised by Dr. James Lind, of Edinburgh, who introduced it to the notice of the Royal Society in 1775. Dr. Lind's description of his invention, which was intended solely for a wind gauge (nothing about the pressure exerted by confined gases being then known), runs as follows:

"This simple instrument consists of two glass tubes connected together like a siphon by a small bent glass tube. The whole instrument is easily turned round upon the spindle by the wind, so as always to present the mouth of the tube toward it. The force or momentum of the wind may be ascertained by the assistance of this instrument, by filling the tubes half full of water . . . and observing how much the water is depressed by it in the one leg and how much it is raised in the other."

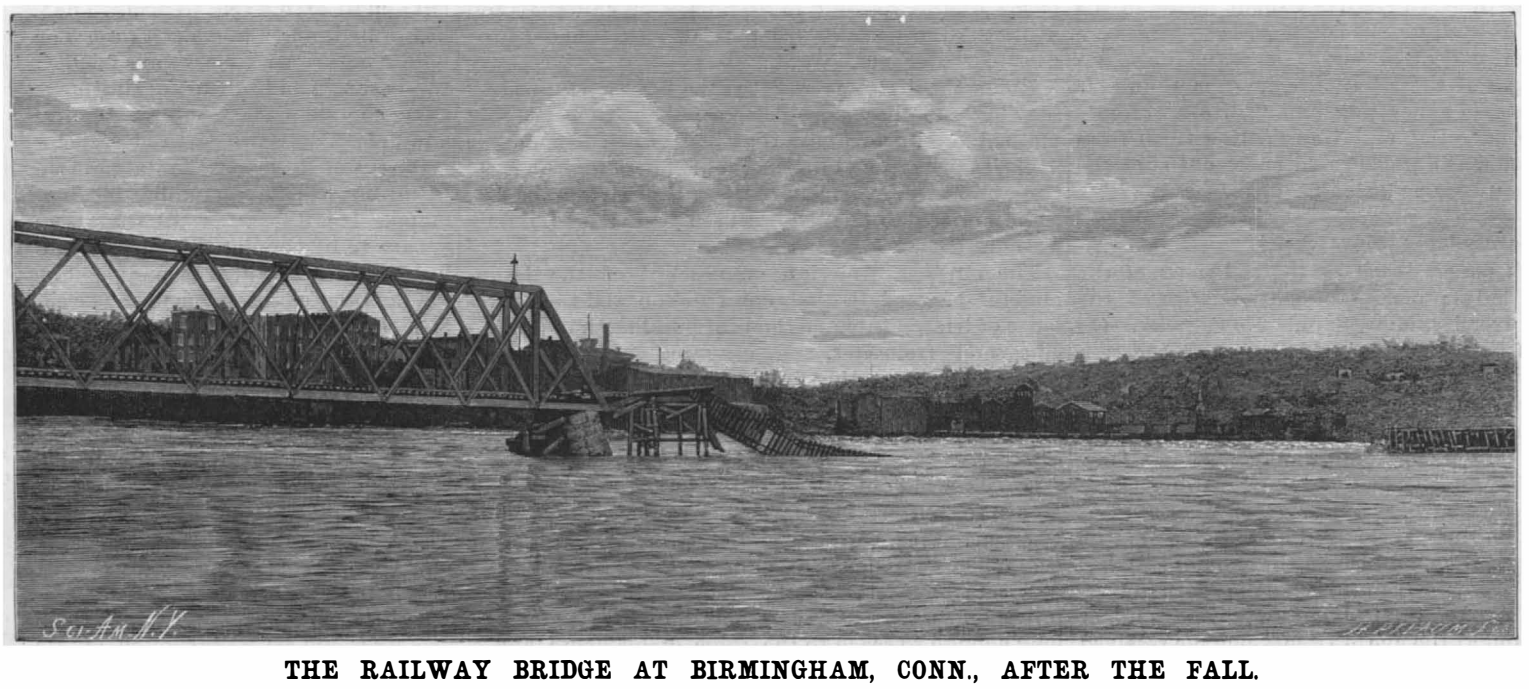
A drawing which accompanies this description shows a perfect siphon pressure gauge, with a vertical scale of inches and tenths between the legs; but this seems to be a modern form of the instrument made by Negretti & Zambra, and still called Lind's anemometer. There are not many philosophical instruments which perpetuate their designer's name after the lapse of more than a century. Mr. Lewis, however, claims priority for M. Pierre Daniel Huet, Bishop of Avranches, who was born at Caen, in 1630. A description and figure of a toy-like instrument supposed to be constructed upon the principle of the siphon anemometer appeared in a volume of "Huetiana," published at Amsterdam in 1723, or more than 50 years before Dr. Lind produced his apparatus. It is stated in this book that Bishop Huet gave a sketch of his device to Hubin, an English philosophical instrument maker of the period, who undertook to make the apparatus to the drawing, but died before the invention could be carried out. So the Huet pressure gauge was never made; but it is quite sufficiently illustrated and described to entitle Bishop Huet to the credit of the invention.

Swamp Moss.

The Albany *Cultivator* concludes that one of the best and most useful substances in connection with vegetable gardening is swamp moss or sphagnum. Any vegetables liable to become shriveled by exposure will retain their freshness when packed in it. It has the advantage over damp sawdust in not being liable to heat or ferment. It is lighter and softer than sawdust, and is, therefore, well adapted for packing celery in winter. It is placed in a cool cellar in a manner like the packing for railway conveyance. The box in which it is to be deposited, having a depth equal to the length of the plants, is placed on its side, and then alternate layers of moss and celery placed in it till full, when it is returned to its position for keeping the plants erect. After being thus properly packed, the only care is to see that the moss is kept moderately damp, and when water is to be used, apply it to the bottoms of the plants.



THE HOUSATONIC RIVER FLOOD—PARTIAL DESTRUCTION OF THE RAILWAY BRIDGE.



THE RAILWAY BRIDGE AT BIRMINGHAM, CONN., AFTER THE FALL.

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Japanese Lacquer for Our War Ships.

Japanese lacquer is being tried at the Brooklyn navy yard with a view to the protection of the steel hulls of the new navy from the corrosive action of sea water and the fouling of the bottoms by marine growths. For the past six weeks two plates of iron and steel respectively, each four feet square, and covered with three coats of anti-corrosive and three coats of anti-fouling lacquers, have been suspended from the over-hanging shelf of the monitor Nantucket into the salt water at the navy yard. These plates will remain undisturbed for six weeks longer, and then be taken out for expert examination. An engineer at the navy yard who has recently returned from a cruise in Asiatic waters, where he had an opportunity to study the principles and results of lacquer treatment, said:

"These two plates were coated by a lacquer manufacturer at Tokio. Several of the officers of the navy have given much study to the subject, and have inspected several vessels of the Japanese navy at the Yokusuka dock yard, and there seems to be no question that lacquer on ships' bottoms is superior to any paint yet found. The Japanese navy has met with success in its use. In the case of one vessel which had not been out of the water in nine months, the bottom was in perfect condition, free from marine growth and showing no evidences of corrosion. The lacquer itself was perfectly smooth and unbroken over all the surface of the plates submerged. The lacquer itself has no chemical action or magnetic oxide; and galvanic action, which interferes with the success of so many anti-fouling paints, is prevented by the waterproof and insulating properties of the lacquer coat.

"What would be the cost of putting this on? Well, with a vessel like the Boston, the cost of lacquering the entire hull would be about $5,800, and for a vessel as large as the Maine about $8,400. But one coat of lacquer is said to be sufficient for a three years' cruise. The whole coast of Asia is adapted to the cultivation of the lacquer tree. The tree is found in China and Corea, but is more extensive in Japan, where lacquer is in general use, and new groves are being established there. The lacquer, which is a thick or gummy grayish juice, is gathered from trees not less than five years old, and by making incisions in the bark."

Water Power into Electricity.

One of the features of the coming electrical exhibition at Frankfort-on-the-Main will be the transmission of power on a scale hitherto never attempted. When it was announced some months ago that it was proposed to transmit 100 h. p. from Lauffen-on-the-Neckar to Frankfort, a distance of more than a hundred miles, the statement was received with smiles of incredulity, but now it seems quite probable that not only will the experiment be tried, but that it will succeed, in spite of the engineering difficulties that have to be surmounted. The government has been asked to supply line for the purpose, and on the system used the expense will not necessarily be at all severe, for the use of very high potential alternating currents is the feature of the scheme as at present planned. The alternating generator will supply a step-up transformer, that in turn will transmit its secondary current at an enormously high potential along the line, to be retransformed by a step-down transformer at Frankfort to a potential practicable for an alternating motor. A series of experiments carried out recently at Oerlikon involve the use of pressures as high as 33,000 volts on the line. At such a potential the current transmitted becomes so small that the line is a relatively small factor in the losses incurred, even though it be of the extreme length proposed. Nothing can better illustrate the characteristic advantages of the alternating system than this beautiful process of generating and utilizing currents at a moderate potential, and transmitting them from station to station at a pressure so enormous that the losses in transitu become insignificant.—*Elec. World.*

Madame Kovalevsky.

The Swedish papers bring us the sad news of the death of the lady professor of mathematics at the Stockholm University, Mme. Sophie Kovalevsky. On the evening of February 6 she felt ill, and on the 10th she died of an attack of pleurisy. She was born in 1853 at Moscow. She early lost both her mother and her father, and, having ardent sympathy with the movement which was spreading among Russian youth, she applied for, and at last obtained, permission to study at St. Petersburg. In 1869, when she was but sixteen years old, she was received as a student at the Heidelberg University, and began the study of higher mathematics. From 1871 to 1874 she was again in Germany, this time at Berlin, studying mathematics under Weierstrass; and at the age of twenty-one she received the degree of doctor of philosophy at Gottingen. In June, 1883, she was offered the chair of higher mathematical analysis at the Stockholm Hogskola, on condition that she should lecture during the first year in German, and afterward in Swedish. This she did, and most successfully too—some of her Swedish pupils already being professors themselves. She wrote many mathematical treatises.—*Nature.*

Great Conflagrations in History.

Among the great fires of history, undoubtedly the burning of the Serapæum library at Alexandria, in the year 640, by the Caliph Omar I., is most widely mourned, as the destruction of 500,000 volumes cut off much of the record of human knowledge at that time. The general impression of the importance and significance of this fire is, no doubt, augmented in great measure by the alleged answer of this Saracen conqueror, who replied to the protest against the burning with: "If these books are against the Koran, they are pernicious and must be destroyed. If they agree with the Koran, they are redundant and need not be preserved;" and it is not generally remembered that Julius Cæsar burned a larger library of 700,000 volumes at Alexandria, known as the Brucian library, B.C. 48, nearly 700 years before the burning of the Serapæum library by Omar I.

At times of sack and pillage, Jerusalem has been burned time and again; the most noted instance being at the siege by the Romans under Titus, during the year 70, when a faction called the Sicarii set the city on fire in many places, and eventually 1,100,000 of the inhabitants perished by fire and the sword.

Constantinople has, like all Oriental cities, suffered severely from fires, a large part of such losses being undoubtedly due to the fatalism of the Mohammedans, who bow to their kismet. Said a sultan: "If it be the will of Allah that my favorite city burn, it is the will of Allah."

In Dillaway's quaint account of travels in the Levant in 1797, it is stated that the sultan is summoned three times to a fire in Constantinople, and if the fire lasts an hour he is obliged to attend in person and bring mules laden with piasters for the firemen.

A great fire at Rome, 12 B. C., caused the Emperor Augustus to take measures for increasing the defense against fire, which had been hitherto in the hands of bodies of police, numbering 20 or 30, stationed in various portions of the city, and re-enforced at times of fire by companies of volunteers. He appointed new officers with the rank of magistrates, who were entitled to wear magisterial robes. Each was attended by two lictors, and provided with a fire organization of 600 slaves.

It is probable that this was not entirely satisfactory in its operation, because six years later another fire caused him to undertake further reforms on a scale fully characteristic of him who "found the city built of brick and left it with palaces of marble." He increased the fire department to a scale commensurate with the needs of the city. Seven thousand freemen were organized into seven battalions, and one battalion was quartered in every alternate ward of the city. These men made careful inspections of the kitchens, of the heating apparatus, and of the water supply in the houses, and every fire was the subject of judicial examination. The cost of the organization was maintained by a tax of 25 per cent on the sale of slaves.

Two notable examples of contagions stopped by conflagrations are the burning of Moscow by the besieging Tartars, in July, 1570, when the plague was stopped, and secondly the fire in London, September 2, 1666, which also stopped the plague, and it has been unknown there since.

This London fire is properly called the great fire of modern history, because the reforms which were started in consequence of it are living issues in the municipal affairs of to-day. The fire was caused by an overheated baker's oven; and in the course of four days it swept over 436 acres, burning 13,200 houses, 89 churches, and St. Paul's Cathedral, causing a damage estimated to be £10,716,000, say $53,500,000.

Under the directfon of Pepys the fire was stopped by blowing up buildings, which was, at the time, the only method of reducing a fire that had grown beyond the capacity of the small fire engines. These were on large tubs, and threw a stream of water directly on the fire, as hose was not invented until ten years later (1672) by Van der Heide.

The cities of America, on account of the larger amount of wood in their construction and the prevalence of irresponsible methods of building, have suffered severely from fires.

The first devastating fire in America was probably the one occurring at Boston, March 20, 1760, when 400 dwellings and stores were burned, causing a loss of £100,000.

In the colony of Massachusetts Bay, regulations in regard to construction of chimneys and thatched roofs were made as early as March 16, 1630, and various enactments were made at later dates. The ordinance at the town meeting of Boston, March 14, 1645, made provision that each householder should have ladders long enough to reach to the ridge of his house, and a pole "about 12 feet long, with a good large swob at the end of it;" and various graded penalties were provided for those not conforming to the law.

Philadelphia has been remarkably free from conflagrations in comparison with other large cities. It does not appear to have been visited by a great fire until July 9, 1850, when a fire along the Delaware River front, at Vine Street, extending over 18 acres, caused a loss of life estimated as high as 33, in addition to 120 wounded, and a pecuniary loss of $1,500,000.

New York was visited by a severe conflagration in the southern part of the city on December 16, 1835, which extended over an area of 40 acres, destroying 674 houses, and causing a loss which has been estimated as high as $30,000,000, on which there was only $8,000,000 insurance—an amount which ruined several insurance companies.

One of the first of the more recent conflagrations was the burning of Portland, Me., July 4, 1866. The fire was caused by a boy throwing a firecracker into a cooper's shop, for the avowed purpose of scaring the workmen. In this respect the act was an unparalleled success, the damage being about $10,000,000.

The Chicago fire, October 9, 1871, was one of the largest in all history, devastating an area of 3½ square miles, and causing a loss of about $190,000,000, on which insurance was paid to the amount of about $100,000,000. Two hundred and fifty lives were reported lost in this fire.

Thirteen months later to a day, Boston was visited by a fire which extended over an area of 65 acres, burning the best mercantile buildings in the city, and causing a damage of $75,000,000, on which there was an insurance to over $65,000,000. C. J. H. WOODBURY.

Artificial Flower Making.

The process of flower making begins with the man who stamps out leaves and petals, says the *N. Y. Sun.* He has perhaps 100 short, stout iron spikes, each bearing on one end an iron stamp, fashioned so as to cut out of cloth bits shaped like the petals of one flower or another. The cloth, velvet, sateen, satin, or what not, is laid upon a leaden slab and the stamp is struck smartly with a hammer. In this way thousands of petals are struck out rapidly, the cloth being folded many times before the process begins.

From the stamper the work passes to the dyer. The latter is usually a Frenchman or German learned in the art of mixing colors. Rose petals come to him white, and he dabs each with a bit of carmine, leaving the points untouched. From him the petals, ranged in rows on a board, pass to a boy or girl, who applies a bit of yellow dye to the white point. Then the petals are put over a furnace to dry.

From this point onward the work is done exclusively by girls. Their tools are extremely simple. The gopher is a little iron implement for curling petals. Tweezers, scissors, and mucilage brush about complete the outfit.

The flat rose petals are set before half a dozen girls, seated around a table, upon which glows a small gas furnace. Each girl is armed with a gopher, and the gopher, after being heated a moment in the flame of the furnace, is applied with a quick wrist motion to the petal as it lies upon a little cushion. Under the heat and pressure the petal is instantly curled into a hollow, cup-like imitation of the natural object. The freshly gophered petals are presently put together along with the stamens or "pips," as they are called in the trade. These are usually made by machinery at another factory.

Sometimes the stem and branch of the rose are imported, and merely tacked on in the factory; but this part of the business is also carried on here, and there are some branchers in New York.

Although the work is thus minutely subdivided, the best flower makers learn the business in its entirety, save stamping and dyeing. Those branches seem to be left almost exclusively to men. The test of a girl's skill lies in her ability to make a rose. The best rosemakers follow nature with marvelous fidelity. The manufacturers show you branches of clustered roses with everything complete, even to great natural-looking thorns and defective, worm-eaten blossoms.

Dozens of flowers are imitated in the factories of this town, but the more familiar blossoms are most in demand. It is a secret of the trade that blue corn flowers are to be popular this spring, and there are many hundreds of boxes of them blooming beautifully in the factories at this moment. The show rooms at the factories are a perfect delirium of color now, and the stock will go on accumulating until the retailers begin to get hold of it six or eight weeks hence. January is the height of the busy season with the flower makers, and the work goes on briskly through February and March. It is duller in April, and by the first of May there is nothing more to do. Then, however, preparations are made for feather curling, and during the hot weeks of July thousands of deft fingers are busy making the feathered ornaments that are to adorn fashionable hats in the following winter.

If flower making went on the year round, the flower makers would be well enough off. A clever girl acquires in two years sufficient skill to command from $8 to $12 a week, and the best workers earn even as much as $18 a week. Forewomen get from $20 to $30 a week, though the latter is a high figure. Most of the girls are very young. Many begin to learn the business at 12 to 14 years of age, when they can earn only $1 a week, and when some even must pay for the privilege of learning.

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THE CARE OF THE FEET.*

A corn comes of an injury to the flesh, while the bunion comes of an injury to the joint. A specimen sketched from nature is shown in Fig. 1. Other than this their growth is quite similar, and quite frequently one is the outcome of the other. The corn may induce a bunion, or the bunion a corn. Bunions, I believe, are never found except upon the joint of the great toe. A hard corn at this point may press so severely against the joint as to injure it, giving growth to the bunion, while on the other hand the joint being injured produces a bunion, which as it grows fills the shoe, causing a friction that gives birth to a corn, making a flourishing combination.

In every joint of the body there is a membrane the function of which is to secrete a fluid that acts as a lubricant. In the joint of the great toe this membrane is called the *bursa mucosa*, and when injured, inflames and swells. This swelling is commonly known as a bunion. Thus it is seen that bunions are located in the joint, and the swelling is only its effect and not the bunion itself.

A bunion is very rarely found on a foot the great toe of which lies in direct line with the center of the heel, but the more the great toe is twisted to one side, the more susceptible is the joint to bunions. To effect a permanent cure it is imperative that the great toe be restored to its normal position. To do this first secure a pair of shoes that will permit it, but this will count as naught unless the hose is constructed upon the same principle. The ordinary stocking is shaped at the toe like Fig. 2. It will be seen at a glance that the toe is held in the same position here as in an ill-fitting, narrow-toed shoe—all bound together in a heap. We never think of binding the fingers together in such a manner, then why afflict the toes? for surely they are quite as important in their way as the more honorable members—the fingers. Not long ago Mrs. Amelie Rives Chanler startled the public in general, and newspaper reporters in particular, by donning a pair of digitated hose. While her ideas were a little beyond the times, I do thank her for breaking the way for digitated hosiery. While I am not prepared to advocate this idea in shoes, it is the correct one for hosiery, and the toes cannot assume their normal position when clothed otherwise. Not only would it be a preventive of bunions, but of soft corns.

If the reader is not prepared to make so radical a departure as digitated hose, and desires a cure, then the next best thing must be done by cutting open the stocking and separating the great toe from its neighbor, as in Fig. 3. Use the foot bath quite frequently to allay the inflammation, and remove whatever callous flesh there may be. At night bind the bunion with linen, well saturated with neat's foot oil. Wear a shoe that will allow the great toe to resume its normal position. The shoe must also be of some soft, pliable material. A felt shoe is the best that can be procured. If the swelling is on the under side of the joint, then use a thick, soft inner sole from which a portion has been cut away to "fit" the bunion. If, after this treatment has been followed for a few weeks, there is no relief, then the chiropodist must be visited, as the bunion is beyond ordinary treatment.

It cannot be too strongly impressed upon the mind that the feet require quite as much or more attention than the hands, yet no member of the body is so sadly neglected. If any physical ailment assails us, we straightway call in the physician and are dosed homeopathically or allopathically, according to his school; if we fracture a limb, then the surgeon attends; if our teeth trouble us, then we visit him who makes a specialty of their treatment—the dentist. Then when our feet are diseased, why not visit him who makes a specialty of their cure—the chiropodist?

It is now quite fashionable to have our hands and finger nails cared for by the specialist, for beauty's sake; why not have our feet so treated for comfort's sake? To enjoy comfort and preserve the health of the feet, we cannot be too careful in the selection of our footwear. Too often an ill-fitting shoe will be endured on the ground of economy, the wearer saying that as the shoes are bought, his money's worth must be gotten out of them, and so persists in wearing them. The wearing out of one pair of ill-fitting shoes will damage the feet to a greater extent than can be repaired during the lifetime of several pairs of perfect-fitting shoes, for unfortunately the evil that misfits do lives after them.

Of course the first essential is a shoe that *fits* the foot; then come some little points which, though they seem trifling, are of vital importance. Few persons give thought beyond the fit of a shoe, and most of us overlook as seemingly small matters the material from which the shoe is made or how the feet are clothed.

That cold feet are detrimental to good health as well as comfort, every one will admit, and they should also know that if the feet become overheated, it is quite as injurious to health; therefore, the desideratum is to wear only that which will preserve the normal temperature of the feet. It is a well known fact that woolen garments next the body absorb perspiration better than linen or cotton, and thus protect the skin from that chill which accompanies the sudden cooling of the body. In accordance with this theory we often see writers recommending woolen stockings for the feet. In most cases this is a great mistake, and if followed, results in making the feet tender and very susceptible to cold. In the case of the woolen garment next the skin, the porous clothing over the woolen garment acts as a sort of safety valve, carrying off surplus heat and moisture; whereas the woolen stocking is surrounded by a comparatively non-porous leather, which only tends to increase the heat and moisture of the feet. If a cloth shoe is worn, then the woolen stocking is in place, for there is then an outlet for the exudation of the feet. The rule in the selection of hosiery should be to regulate the amount of wool according to the porosity of the leather. With porpoise or patent leather, wear silk or cotton; with calf, kangaroo or grain, wear a mixture of cotton and wool or merino; with cloth shoes, wear woolen stockings.

FIG. 1.—A Sketch from Life Showing a Bunion of Joint of Great Toe.

A very important item in the care of the feet is their frequent and judicious bathing. In order that the epidermis be clear of all exudations and the skin in healthy condition, the feet should receive at least a sponge bath in the morning and a warm-water bath at night. The former opens the pores and stimulates the circulation, while the latter cleanses the skin of all surplus epidermis and allays all inflammation. If the feet are very tender and have a tendency to perspire freely, then it might be well to occasionally add a little salt and alum to the water. If the perspiration is profuse and attended by odoriferous exhalations, sprinkle a little pulverized tannin in the shoes about once a week.

FIG. 2.—Ordinary Shape of Stocking.

FIG. 3.—Stocking in which the Great Toe is Separated from its Neighbors.

This has the effect of regulating the flow of perspiration without interfering with the healthy action of the skin.

Abraham Lincoln, who suffered very much from tender feet, used quite often to remove his shoes, in order, as he said, "to give his feet a chance to breathe."

Not only should our feet be given an occasional "breathing spell," but our shoes should be afforded the same opportunity. No shoe should be worn more than two days continuously, and then be given four days' rest. As this would necessitate having on hand three pairs of shoes, many might object on that account; then two pairs, if worn on alternate days, will nearly serve the purpose. If only one pair can be afforded, then the next best thing that can be done is a frequent change of innersoles. As these only involve an expenditure of ten cents a pair, at least three pairs should be at hand, giving each a day's wear and two days' "breathing spell."

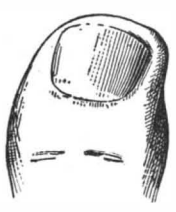

FIG. 4.—A Great Toe Having an Ingrowing Nail.

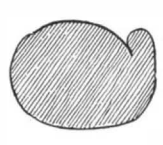

FIG. 5.—Sectional View of Same.

FIG. 6.—The Remedy.

Finger nails and toe nails are nothing more than hardened forms of the epidermis. When examined near their origin, they are found to consist of cells, which gradually dry into scales. These remain coherent after their formation. A new production is constantly taking place in the groove of the skin in which the root of the nail is embedded, and most likely, also, from the whole subjacent surface. The growth of the nails is due to deposits of albumen at their roots and upon their under surface. The red lines seen at their base are due to the presence of a great number of capillary vessels, which provide for the formation of the nail, the whole structure being a wonderful and delicate one that should be well and properly cared for. The only occasion for the use of a sharp instrument in this case is that of the scissors in cutting them to reduce their length. An ivory presser should be used to remove the scarf skin from the free margin. The edge of the cuticle should never be pared, nor the surface of the nail scraped, the nails should be cleaned only with the nail brush to have them at their best, aided, of course, by soap and water. An observance of these simple rules will prevent much useless trouble with the nails of hands and feet.

When we wear a shoe that is too short for the foot, the end of the nail is brought against the leather. This interrupts its forward growth, and as new material is added to it, it spreads out on the sides and becomes unusually thick. It then presses upon the soft parts of the toe, and is said to "grow into the flesh," and is termed an ingrowing toe nail. A top view of one is seen in Fig. 4, and a sectional view in Fig. 5. The prevention of this is obvious, but its cure no pleasant operation.

Should the case be a severe one and attended by proud flesh, then it is a case for the surgeon, and should receive immediate attention, or the proud flesh will soon attain such growth as to require the removal of the nail, which is a more painful operation than that of removing the toe or a limb. The ordinary ingrowing nail can be cured by a little time and close attention. First of all, the cause must be removed and a shoe worn that is very soft and pliable, affording plenty of room for the free movement of the toe. Next soak the foot well in warm water, to remove inflammation and render the nail pliable. Do not cut the nail, particularly at the corners. Press small pellets of lint as far under the corner of the nail as possible without causing pain, and wrap the toe very lightly with linen well saturated with glycerine. Dress the toe at least twice a day, replacing the lint, and endeavor each time to slightly increase its quantity. When the nail becomes long, cut it so that the corners will project beyond the center.

Another remedy that has been found to be quite effectual is to cut a small notch at the center of the nail, leaving the corners square. Then begin about half way back on the nail and scrape toward the notch until the nail is quite thin, as shown in Fig. 6. This leaves the nail a thin strip through the center and relieves the pressure from the sides.

*By A. J. Moore, in *Boots and Shoes Weekly*.

A Bridge Built by Red Ants.

The following remarkable story, told by an eye witness, is entitled to a place among the instances of intelligence among the lower animals. A cook was much annoyed to find his pastry shelves attacked by ants. By careful watching it was discovered that they came out twice a day in search of food, at about 7 in the morning and 4 in the afternoon. How were the pies to be protected against the invaders?

He did not have long to wait, for at 6:50 o'clock he noticed that off in the left hand corner of the pantry was a line of ants slowly making their way in the direction of the pies. They seemed like a vast army coming forth to attack the enemy. In front was a leader, who was larger than any of the others, and who always kept a little ahead of his troops.

They were of the sort known as the medium sized red ant, which is regarded as the most intelligent of its kind, whose scientific name is *Formica rubra*.

About 40 ants out of 500 stepped out and joined the leader. The general and his aids held a council and then proceeded to examine the circle of molasses. Certain portions of it seemed to be assigned to the different ants, and each selected unerringly the point in the section under his charge where the stream of molasses was narrowest. Then the leader made his tour of inspection.

The order to march was given, and the ants all made their way to a hole in the wall in which the plastering was loose.

Here they broke rank and set about carrying pieces of plaster to the place in the molasses which had been agreed upon as the narrowest. To and fro they went from the nail hole to the molasses until, at 11:30 o'clock, they had thrown a bridge across. They then formed themselves in line and marched over, and by 11:45 every ant was eating pie.—*Chicago Tribune.*

THE COBURN trolley track for step ladders, described in our issue of January 31, and which we have now had in practical use for the past two months, has proved itself to be a most convenient and labor-saving device. By its use all the compartments in a line of high shelving are rendered readily accessible, the ladder itself being so light and so easily moved that any special point can be reached with great facility. The manufacturers report their sales last month as larger than ever before in the same length of time.

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RECENTLY PATENTED INVENTIONS.

Railway Appliances.

CAR COUPLING. — Robert McMahon, Seattle, Washington. The drawhead of this coupling has a vertical guide tube loosely embraced by a rocking bar supporting the coupling pin, which has a flanged head, and whose toe is engaged by a pivoted cam block, in connection with a tripping device, forming an automatic coupling, and one which may be operated from either side or the top to couple or uncouple cars.

CAR COUPLING.—Michael F. Finnerty, Brooklyn, N. Y. By this invention a transverse bar is adapted to slide vertically in the drawhead, the bar having a pin which projects at right angles, while the coupling link is adapted to be engaged by the bar and pin, the device being automatic in operation, and being designed to make ferryboats fast in their slips as well as for coupling cars.

STATION INDICATOR.—William S. Mallard, Darien, Ga. This is a device more especially adapted for use on steam or street railway cars, and to be located in convenient reach of the conductor or brakeman, consisting of a suitably constructed casing to carry indicator plates, means being employed to automatically hold each plate in a sight opening, and move the slides successively as desired, a gong being rung at each change of the slides.

ELECTRIC RAILWAY TROLLEY. — William J. Cavert, Albany, N. Y., and William P. Wiswall, West Troy, N. Y. The bearing below the trolley wheel has an upwardly projecting fork embracing the conductor beyond the wheel, and adapted to contact when the trolley wheel fails, with other novel features, the trolley being adapted to follow the conductor without cramping, and having a guard attachment also adapted to clear ice from the conductor.

Mechanical.

LOOM SHUTTLE TENSION DEVICE.—Squire Bentley and Alfred Bentley, Paterson, N. J. This is a tension regulator for shuttles used in weaving ribbons or other narrow goods, and consists of a spring wire spring having one end fixed to the shuttle body and the opposite end coiled around the quill spindle and arranged to press against one end of the quill, and is designed to hold the latter with an even pressure, without regard to the amount of silk on the quill.

CHAIN. — Richard Paxson, Philadelphia, Pa. This invention relates to cable chains, such as used on cranes for raising and lowering heavy weights, and for other machines, and provides an open link chain, the links in different planes and crossing one another, with concave bearing surfaces on opposite faces of the links upon opposite sides of the opening through the links, forming a new article of manufacture.

Agricultural.

CORN HARVESTER. — Thomas C. St. John, Willoughby, Ohio. This machine has two parallel inclined beams adapted to straddle a row of corn, with a series of inwardly inclined fingers pivoted to each of the beams, and adapted to swing upward and outward, the machine being moved over the field to cut the ears from the stalks and gather the corn in the wagon by which the machine is carried.

SHOCK COMPRESSOR.—James K. Miller, Emporia, Kansas. The body portion of this device is split longitudinally to form two arms, one of which is prolonged and formed into a narrow neck and a terminal head, a pulley being pivoted between the arms and the head apertured to receive a rope, to compress fodder and corn shocks and hold them while they are being tied.

DEHORNING CALVES. — Charles T. Ingraham, Dwight, Ill. Two knife arms are pivoted together, supporting knives of special form, one of the knife arms having a handle and the other being adapted to be struck by a suitable implement to force its knife toward the other one, for conveniently and rapidly cutting out the horns of calves, so as to prevent further growth.

Miscellaneous.

BACKING PLATES FOR PRINTING. — Jacob C. Wolfe, New York City. This inventor has obtained two patents for backing for electrotype or stereotype shells, there being in one case a metal box-like backing having vents in one face to receive surplus cementing material, the backing having straight sides and ends and being of the least possible weight, while in the other case it consists of a body shell with an interior lattice work and a top plate detachably attached thereto, adapted for the reception of the shell, whereby one base or backing may be utilized for printing matter contained upon any one of a number of shells.

BOOK CASE. — Isaac C. Woolrey, Geneseo, Kansas. This case has a series of vertically arranged partitions fitted to slide freely between the shelves, with horizontally arranged springs connected to the several partitions and holding them yieldingly apart, whereby each book is held between two movable partitions, thus protecting the books and holding each in its assigned place.

TRAMMEL HEAD.—Reinhold G. Hausdorfer, Zanesville, Ohio. Combined with a head frame having a trammel point is a shoe pivoted in the frame, while there is a clamping plate engaged by two thumb screws, a fulcrum pin uniting the frame and shoe, affording means to secure the points of a beam compass upon the elongated bar or beam of the instrument and adjust them with great accuracy.

TRANSPOSING KEY BOARD.—James M. Gilbert, Putney, Vt. A series of finger keys is pivoted in a movable frame, while there is a rack and pinion movement for actuating the frame and a locking device for the pinion, with other novel features, making a quickly and easily adjusted device for a piano or other instrument by which music may be played in a higher or lower key.

BRIDGE GATE. — Henry E. Dewey, South Haven, Mich. This is a gate designed to be operated from the land side or the bridge, but shut off from connection with the bridge when operated from the land side, and shut off from the land when operated from the bridge, while the gate when closed will be securely braced, so that it cannot be broken down by runaway teams.

HOSE WASHING MACHINE.—Anderson B. Cosby, Richmond, Va. A portable frame or carriage is provided with an annular spraying pipe through which the hose is passed, a supply pipe being connected with the frame and supporting the pipe, while a discharge pipe supports a trough through which the hose is passed and in which it is washed while passing through.

HOOK. — James K. Miller, Emporia, Kansas. This hook has an eye in its shank, two oppositely extending hooks at its lower end, and a central hook at right angles to the others, being one by means of which a rope may be easily and quickly fastened, and convenient for use in fastening bundles, for hoisting purposes, and various uses.

PAVING BRICK.—Athelstan O. Jones, Zanesville, Ohio. This brick is of greater vertical depth than width, and has rounded upper edges, forming seams or grooves when laid, while it has diagonal grooves on one side, vertical grooves on the other side, and horizontal grooves in the ends, to receive pitch or cement to be flowed between the bricks to bind them tightly in the roadbed.

TRUNK ATTACHMENT. — William R. Sutley, Mitchell, South Dakota. This invention provides a handle bar with parallel limbs to loosely embrace the sides of the trunk, and slide in and out in keeper loops attached thereto, there being spring stops on the ends of the limbs to contact with the loops, the device giving a leverage to facilitate the movement of heavy trunks and packages, on which any suitable form of caster may be used.

LOCK.—Thomas A. Phillips and James J. Greenhoe, Williamstown, Pa. In this lock the case contains a horizontally movable frame on which is formed a locking bar with horizontal ribs, a tumbler fixed to the lock spindle moving in a recess of the frame to actuate it, with other novel features, the lock being designed for use without a key, and for arrangement from the inside of a building or room in such a manner that it is impossible to operate it from the outside.

DOOR KNOB. — Henry F. Keil, New York City. A shank is adapted to pass into a recessed head, and soft metal balls are pressed through openings in the shank extending into recesses in the head to fill the openings and recesses, thus securing the shank to the head or handle in a simple and effective manner.

KEY. — Paren England, Aspen, Col. This key is provided with an attachment in the form of a supplemental bit pivoted to the key shank, forming a locking member serving to plug up the key hole, the key part proper being retained in position in the lock notwithstanding any jarring or shaking of the door.

ABSORBENT BOTTLE COLLAR. — Benjamin H. Day, Jr., West Hoboken, N. J. By this invention a flexible band is adapted to hug the neck of the bottle, being held in place by a retaining wire, the device being designed to catch and retain the drip when pouring from a bottle or other vessel to which it is applied.

TABLET ORNAMENT.—Louis B. Prahar, Brooklyn, N. Y. A front and back plate are pivoted together to hold between them leaves of celluloid, ivory, etc., in connection with an automatic or other latch stop and means for attaching the back plate to a pocket book, traveling bag, etc., forming a tablet convenient of access and of ornamental description.

CORSET FASTENING. — Thomas J. Brough, Baltimore, Md. The lock of this device has a handle bar and a hook which projects through and is journaled in a cap plate secured to the corset, the cap plate holding the lock to the corset and forming a bearing for its pivotal movement, making a simple and economical fastening.

TOBACCO BOX. — Joseph Lewis, Winsted, Conn. This is a box for holding tobacco in plug or stick form, and has an attached knife and feeder to supply the tobacco in cut portions as required, the knife portion occupying one end of the box, which it closes when not in use, while a swinging handle shuts within a recess in the side of the box.

MUSTACHE TRAINER. — Isaac Commons, Piqua, Ohio. This device consists of a piece of flat spring metal bent to form two limbs which may be brought in engagement with each other, two such clasps being employed to retain the mustache in desired position.

TOY BUZZER. — George T. Fallis, St. Joseph, Mo. This is a device to be whirled in the air, when it emits a buzzing sound, which increases or decreases according to the momentum, the device being attached to and swung by a string or cane.

TOY PUZZLE. — William W. Brown, New York City. According to this invention a screw or pin is held crosswise in the lower end of a long stem on the inside of a bottle, in a position apparently impossible to place it, but which is made possible by the division of the stem and a rod passed down an inner bore, the device being designed to tax the ingenuity of an investigator. Address E. Muehsam, No. 2 Walker Street, New York, for particulars about this puzzle.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS AND PUBLICATIONS.

EXAMINATION OF WATER FOR SANITARY AND TECHNICAL PURPOSES. By Henry Leffmann and William Beam. Second edition, revised and enlarged, with illustrations. Philadelphia: P. Blakiston, Son & Co. 1891. Pp. vi, 130. Price $1.

The horizon of the medical school is kept in view by the author of this work. It gives all the standard methods for determining the constituents of water, together with a particularly valuable chapter giving, in brief, the biological examination with determination of colonies of bacteria. A table of factors for calculation, and conversion tables, giving the grains per United States gallon and the grains per imported gallon, with other similar tables, and a full index, are contained in the work. Illustrations are used wherever necessary, and as an abstract and compendium of a definite branch of analysis, the work has considerable value.

GEOLOGICAL SURVEY OF NEW JERSEY. Final report of the State geologist. Vol. II. Mineralogy, botany, zoology. Trenton, N. J. 1890. Pp. x, 824.

This is another of the works marking the completion of the report of State Geologist George H. Cook, whose recent decease adds to the interest of these catalogues, for such they are, which have a value to naturalists and can be truly said to be inestimable. The fullness of the work adds additional regret to the feelings of the scientific world for his loss. The present volume is devoted entirely to zoology, including insects, vertebrates, etc.

L'ACIER: HISTORIQUE, FABRICATION, EMPLOI. L. Campredon. Paris: B. Fignol. Pp. 344. 50 illustrations.

This is a very acceptable and prettily illustrated presentation of the subject of modern steel, processes, uses, and tests.

PROGRESSIVE CARPENTRY. By D. H. Meloy. Waterbury, Conn. 1890. Pp. 55. Illustrated. Price $1.

The results of the experience of fifty years are supposed to be condensed into the narrow compass of this little book. It is devoted principally to roof framing and laying out work, and there is no doubt that it will be of use to many carpenters and builders.

PROGRESSIVE EXERCISES IN PRACTICAL CHEMISTRY. By Henry Leffmann, M.D., Ph.D., and William Beam, M.A. Illustrated. Philadelphia: P. Blakiston, Son & Co. 1890. Pp. 104. Price $1.

This little work is very acceptably presented. It treats in a very detailed method of the simplest chemical manipulations, pouring of liquids, filtering and washing precipitates and the other minutiæ of the chemist's work. While it is calculated for the curriculum of certain institutions, the Woman's Medical College and the Pennsylvania College of Dental Surgery, it would be of use in many schools where an elementary course of chemistry only is desired. It extends through the simpler tests and work of inorganic chemistry. It includes 253 experiments, which would keep it within the range of many schools.

A MOVE FOR BETTER ROADS. Essays on road making and maintenance and road laws, with a synopsis of other contributions and a review, by Lewis M. Haupt, and introduction by William H. Rhawn. Philadelphia: University of Pennsylvania Press. 1891. Pp. xvi, 319.

The new movement in the direction of better roads for this country finds an exponent in the present work. It represents the recent essays written in competition for the prize offered by the University of Pennsylvania for writing the best paper on the subject. It contains, in addition to general matter, the first, second, and third prize papers and a number of essays to which honorable mention was awarded, and a digest of the contents of the remaining contributions by Professor Haupt. The information contained in this book is of great variety, and it may be regarded as a standard work on the subject. It is to be hoped that it will produce an enlivening effect upon our legislatures in the enactment of laws promotive of good roads throughout this country.

THE WASHINGTON BRIDGE OVER THE HARLEM RIVER, AT 181ST STREET, NEW YORK CITY. A description of its construction. By William R. Hutton, Chief Engineer. Illustrated. Leo Von Rosenberg, New York. Pp. 96. Plates 63. Price $8.

This magnificent work describes in full detail all the stages of erecting the Washington Bridge in this city. It includes the false work, building of the foundations thereon, systems of hoisting, and all the details of the finished structure. As a monograph of one of the great bridges of the world, perhaps the handsomest of all iron bridges, it is simply beyond comparison. The plates include numerous photogravures illustrating the progress of operations, which come out with extreme clearness. In every respect the work is entirely beyond criticism, and is produced on so luxurious a scale that one can hardly hope that it will soon be surpassed by anything in literature or engineering.

THE FIVE ORDERS OF ARCHITECTURE, according to Giacomo Barrozzio, of Vignola, to which are added the Greek orders. Edited and translated by Arthur Lyman Tuckerman for the use of the art schools of the Metropolitan Museum of Art. New York: William T. Comstock. 1891. Pp. 12. Plates lxxxii. Price $5.

As will be seen from the summary of this work, it consists almost entirely of plates. The five orders treated are the Tuscan, Doric, Ionic, Corinthian, and Composite. All of the orders are of the Roman type, the Doric having a base, and all of the columns being shown in the systematically arranged page as mounted on pedestals. It gives, in other words, classic architecture from the standpoint of the mediæval architect. The book is unexceptionably gotten up as regards the character of the plates, their selection and the utility thereof for the working architect, the shadows cast by the capitals and bases receiving especial attention. The latter feature is cited as an example of the methods followed. Throughout the same care and thoroughness distinguish the work.

APPLIED MECHANICS. By James H. Cotterill, F.R.S. John Henry Slade, R. N. London: Macmillan & Co. 1891. Pp. xiv, 512. Price $1.25.

This excellent little work includes the general branches of mechanics, couples, work and energy, mechanical powers and constructions, the steam engine, strength of materials, and hydraulics. It is fully illustrated, and includes a number of problems for solution by the student. Like so many of the English elementary scientific works, it is written for the curriculum of a special school.

THE RICH MAN'S FOOL. A novel. By Robert C. Givens. Chicago: Laird & Lee. 1890. Illustrated. Pp. 431. Price 50 cents.

THE CHESS PLAYER'S POCKET BOOK AND MANUAL OF THE OPENINGS. Edited by James Mortimer. Fifth edition. New York: Dick & Fitzgerald. (No date.) Pp. 74. Price 50 cents.

The leading openings of chess are treated in this work with considerable fullness. It will be of use to many devotees of the game.

BIBLIOTHECA POLYTECHNICA. Directory of technical literature. A classified catalogue of all books, annuals, and journals published in America, England, France and Germany, including their relations to legislation, hygiene and daily life. Edited by Fritz von Szczepanski. First annual issue 1889. New York: International News Company. London: Sampson Low, Marston & Co. Paris: E. Bernard & Cie. St. Petersburg and Leipzig: Fritz von Szczepanski. 1890.

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MARCH NUMBER.—(No. 65.)

TABLE OF CONTENTS.

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For Sale—New and second hand iron-working machinery. Prompt delivery. W. P. Davis, Rochester, N.Y.

Acme engine, 1 to 5 H. P. See adv. next issue.

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Burnham standard turbine. Burnham Bros., York, Pa.

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Screw machines, milling machines, and drill presses. The Garvin Mach. Co., Laight and Canal Sts., New York.

Tight and Slack Barrel Machinery a specialty. John Greenwood & Co., Rochester, N.Y. See illus. adv., p. 13.

Wanted—A 50 in. × 46 in. × 10 ft. Planing machine. State make and width of table. F. X. Hooper & Co., Baltimore, Md

The best book for electricians and beginners in electricity is "Experimental Science," by Geo. M. Hopkins. By mail, $4; Munn & Co., publishers, 361 Broadway, N. Y.

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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

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Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(2888) **T. F. D. asks for gold luster for** china painting. A. Dissolve 1 drachm gold in ¾ ounce aqua regia, or simply dissolve this weight of chloride of gold in water. Add 6 grains of metallic tin, and enough aqua regia if required to dissolve it. Pour with constant stirring into a mixture of ½ drachm balsam of sulphur and 20 grains oil of turpentine. As it stiffens add ½ drachm oil of turpentine and mix. More gold gives a brighter effect; tin inclines it to a violet tinge. Balsam of sulphur is made by boiling together in a covered vessel 1 part flowers of sulphur and 4 parts oil until the mass thickens.

(2889) **F. T. asks for a receipt for a** composition, by putting which in a small piece of cotton batting the size of a small marble, and placing in a glass of water, it will produce sparks of fire. A. Possibly it is sodium or potassium. It is very dangerous.

(2890) **A. A. B. writes: X contends that** the point of solidification of a substance is the freezing point of that substance, or in other words that any substance that solidifies when its temperature is sufficiently lowered may be termed frozen when in its solid state. As for example: Glass, iron, china ware, etc., in their solid state may be correctly termed frozen. Y contends that this is not so. It is conceded that in general conversation it would not be correct, but from a physical standpoint it would not be incorrect to apply the expression, after the molecules have once congealed. Please decide the question. A. Generally we should say that freezing applies to particular cases of congelation only, and we should not advocate X's contention. It is a question of etymology, not of science.

(2891) **C. T. asks how to remove stains,** made by handling in damp weather, from the highly polished brass work of a microscope. A. Your brass work is evidently not lacquered. Clean with putz pomade, then with whiting, and finally lacquer if the surface is not one having frictional contact with another surface. In this case have the work nickeled.

(2892) **C. P. writes: Your answer to the** following, also the way of doing it, will interest several of your readers. A horse is hitched to a barn 25 feet square at one corner, by a rope 100 feet long; how much area in square feet can the horse feed over? A. He can feed over 4 quadrants, one of 100 feet radius, one of 75 feet radius, one of 50 feet radius, and one of 25 feet radius. These can be calculated by the regular formula $\frac{\pi r^2}{4}$ giving 14,727 square feet.

(2893) **T. F. D. asks for a good receipt** for a harness dressing. A. Mutton suet 2 ounces, beeswax 6 ounces, powdered sugar 6 ounces, soft soap 2 ounces, indigo (real) or lampblack 1 ounce. Dissolve the soap in ¼ pint of water, add other ingredients, melt and mix, and add 1 gill of turpentine. Apply with a sponge and polish with a brush.

(2894) **E. L. asks (1) how to compound a** mixture with which he could coat the inside of a wooden box so that he could use it as a jar for a storage battery. A. Use resin 4 parts, gutta percha in scraps 1 part, and a little linseed oil. Thicken if desired with ground pumice. 2. Would a rubber tube placed between the primary and secondary coils of an induction coil assist in its efficiency? A. No.

(2895) **M. M. L.—For artificial cider the** following is given: 28 gallons soft water, 2 pounds tartaric acid, 28 pounds New Orleans sugar, 1 pint yeast. Stir thoroughly. Let stand in cask with bung out for 24 hours, add 3 gallons spirits, bung tightly, and let stand 48 hours.

(2896) **L. K. writes: I have a 25×30** hard rubber tray which I use for the silver bath; it has a piece broken from one of the sides; can you give me recipe for mending the same and making a good joint? A. Stockholm pitch 3 parts, resin 3 parts, crude rubber 6 parts, turpentine 12 parts; heat and mix. Roughen edges before applying.

(2897) **W. A. L. writes: I have seen a** combination of the usual vulcanite and aluminum in a dental plate. Is the latter likely to develop anything deleterious in contact with acidulous food? A. No. It is simply a question of durability.

(2898) **C. N. C. asks: 1. What will take** quicksilver off a gold ring? A. Heat it very carefully to a temperature of 100° Fah. It is best to intrust it to a jeweler, as you may melt it. 2. What to mix with hydrofluoric acid to make etchings on glass look white and rough like ground glass? A. Do not apply the acid too long. The first effects are frosted, which disappear with deeper etching. You may apply the gaseous acid, evolving it from fluorspar and oil of vitriol in a leaden dish the size of the glass to be treated. The latter is held by cross pieces or otherwise well above the liquid. All glass in the room may be injured. It is best done out doors or in a cellar.

(2899) **B. W. says: We are having a dis-** cussion in class as to what has become of the Great Eastern, the ship that laid the Atlantic cable. Please inform me. A. The Great Eastern was sold in 1888 for old iron, and is now being broken up near Liverpool.

(2900) **H. D. D. says: Will you kindly,** through the SCIENTIFIC AMERICAN, give a rule for finding the velocity in feet per second of a body falling through space at any given time? Example: A body falls 16 feet the first second and 64 feet the first two seconds; what is the velocity in feet per second at any given point? A. Velocity at end of 1 second, 32·166 feet per second; velocity at end of 2 seconds, 64·333 feet per second; 8·02× $\sqrt{\text{height in feet}}$ = velocity at end of fall, in feet per second; 32·166×time in seconds = velocity in feet per second at the end of fall; 16·083×square of the time in seconds = height of fall in feet.

(2901) **W. H. McL. says: Can you tell** me where I can get some seeds of the eucalyptus tree, the variety best adapted to the coast of the Southern States? Also, kindly tell me the name of the worm that cuts off small branches from trees; they seem to prefer the wood of the persimmon and hickory to any other. Is there any way to keep these worms from destroying a grove of small Pecan trees? A. Prof. C. V. Riley, of the Entomological Division, Department of Agriculture, Washington, to whom we referred the above inquiry, replies as follows: The department has no eucalyptus seeds on hand at present for distribution. Mr. McLeod can doubtless secure them from some seed dealer in San Francisco. The insect cutting off branches of persimmon, hickory and other trees is the twig girdler (*Oncideres Cingulatus*), a species of the coleopterous family Cerambycidæ, or Longicorn beetles. The female beetle girdles with her jaws the twigs in August or September, and inserts one or several eggs into the wood above the girdled place. During winter time these twigs are usually broken off by the wind, and the larvæ develop in them on the ground during the next spring and summer. If the girdled and fallen twigs of such trees as are known to be infested are carefully collected and burned in winter or spring, the insect will be kept measurably in check. Good illustrations of the beetle, its earlier stages and its work, are given in the *American Entomologist*, vol. iii, p. 297.

(2902) **T. W. asks: 1. What is the most** conclusive proof for the existence of atmospheric pressure? A. The barometer, which varies in height at different elevations. 2. How close has air been compressed by powerful machinery? A. There is no known limit to its compressibility. Theoretically, a limit can be approximated to. It has been compressed to many atmospheres. 3. Can a tight-fitting piston be drawn out of a cylinder, supposing no air could get behind it? A. Yes. 4. Place a drop of water on dry surface, take piece of straight paper by one end, bring other end down flat on water, it sucks down and is hard to draw away; why is this? A. Capillary attraction. 5. Will condenser fill with water or crush, provided only heat of steam can escape? A. Yes. 6. In breaking a piece of soft iron, do the molecules change from one side to the other, or what is supposed to take place? A. The molecules are supposed to be torn apart. 7. Is not the wear on the same half of the crank pin, no matter which way an engine is running? A. No; it is on opposite halves for the two ways of running. The fallacy of the geometrical puzzle you submit is in the fact that the pieces as cut will not fit. There is a space left unfilled, which accounts for the apparent increase.

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March 10, 1891,

AND EACH BEARING THAT DATE.

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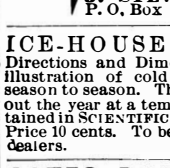

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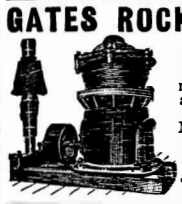

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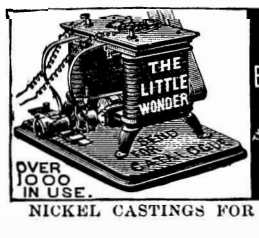

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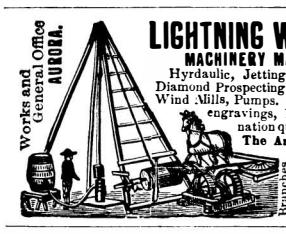

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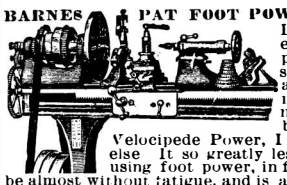
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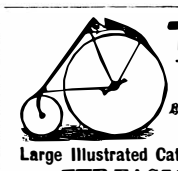
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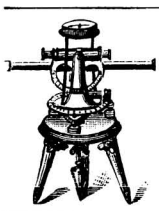
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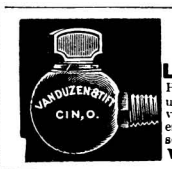

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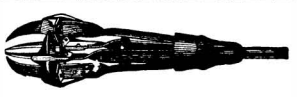
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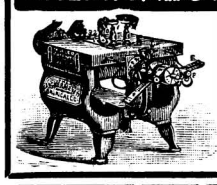
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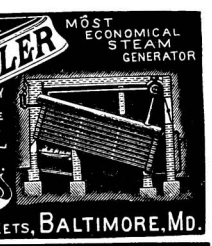
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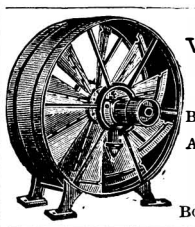
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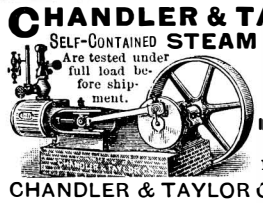
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Interest and Rents in 1890,	312,82 643
Total Receipts during the year,	$2,102,295.44
Paid to Policy Holders and for Expenses, Taxes, etc.,	1,251,413.81
Assets January 1, 1891,	6,810,025.40
Total Liabilities,	5,914,604.01
Surplus by Vermont, New York, Pennsylvania and Massachusetts standard,	895,421.39
Surplus by Maryland standard,	1,237,777.34
21,604 Policies in force, insuring	46,362,301.00
5,833 Policies issued and revived in 1890, insuring	15,148,462.00

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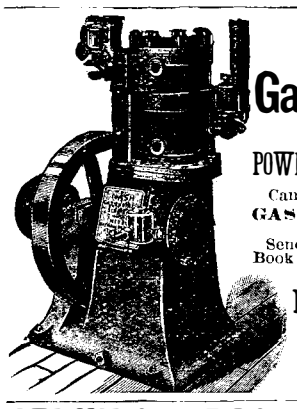

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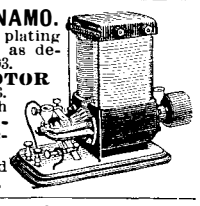

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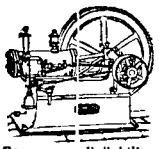

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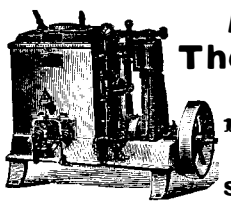

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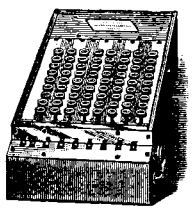

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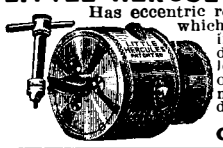

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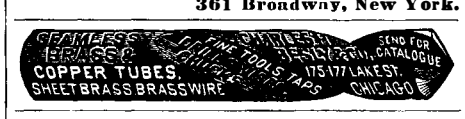

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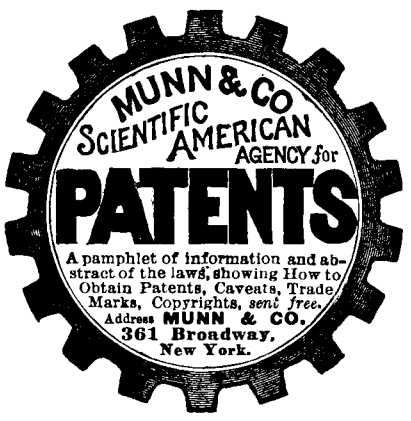
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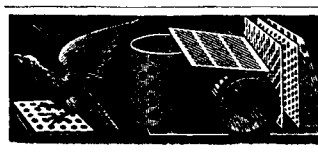

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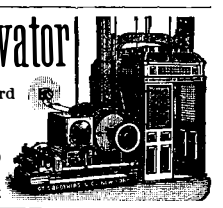

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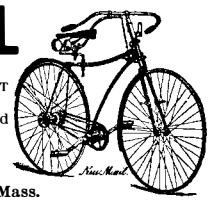

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